STUDIES IN THE APPLIED EPIDEMIOLOGY OF VENEREAL DISEASE

by

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PREFACE

Over a period of years, extending from 1949 to 1955, the author was placed in the fortunate position of having access to clinical and epidemiological records pertaining to many cases of venereal disease. In his capacity of Consultant in Venereal Disease Control to the New York State Department of Health, and his subsequent dual appointment as Director of the Division of Venereal Disease Control and Consultant in Epidemiology to the British Columbia Department of Health and Welfare, it was possible for the author, by utilising this wealth of patient material, to conduct a series of studies upon the epidemiology of venereal disease.

While there are a variety of viewpoints as to what constitutes epidemiology in this field, the writer has chosen as his field of study - contact tracing, its methodology, and its evaluation as a case finding measure. Each of the studies, described herein, has been designed therefore to shed light upon some aspect of contact tracing. The original separate studies, when assembled and presented in sequence, developed, as a result of their interdependence, into a selective thesis on the applied epidemiology of

venereal disease with particular reference to contact investigation.

The plan of this thesis is to present the observations made from 1949 to 1955 and extended by retrospective study to cover the period 1945 to 1955; to discuss the implications arising therefrom; and to permit the findings and reasoning to build up a cumulative conception of the place of contact investigation in modern venereal disease control.

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INTRODUCTION

1. EPIDEMIOLOGY OF VENEREAL DISEASE

Epidemiology is the science of the mass phenomena of health and disease - in other words, while clinical medicine is concerned with disease and health as they affect the individual, epidemiology is concerned with disease and health as they affect aggregations of individuals. The object of epidemiology (applied epidemiology) is to learn enough about the behaviour of disease to be able to detect, prevent and control it, and of health to be able to promote and preserve it.

Without entering into detailed discussion of the evolution of the epidemiological concept as such, suffice it to say that within the past quarter of a century, there has been elaborated[1] an ecologic concept of mass disease, interpreted on the basis of a dynamic relationship between all factors involved, those of the host, the agent of disease, and the environment, rather than the limited relation to a direct inciting agent.

An inherent result of this ecologic attitude towards epidemiology, has been a greater attention

to the factors of host and environment. Thus the significance of human host factors (age, sex, habits and customs, heredoconstitutional, psychobiologic etc.) and of environmental factors (biologic, physical, social and economic) is recognized in so far as they participate to bring about the biological phenomenon of disease or health.

As with any other form of disease and at any one time, the occurrence and distribution of venereal disease in a community will depend entirely upon the ecologic relationships (brought about by whatever means) which exist among the causative agent, the human host and environment. An appreciation of the relationships of these three factors is prerequisite to any intelligent discussion of the applied epidemiology of venereal disease. As Clark[2] has pointed out, these factors are so closely related that changes in one directly influence some phase of both of the others. The organism itself may change as a result of its relationship to the host or to the environment (mutations, variations, adaptations). The host may vary in the degree and type of reaction to the organism as a result of intercurrent infection

or disease or of food deficiencies. The relationship of one host to another may depend upon the extent of crowding, the stresses of life, certain habits and customs of the people. Changes in the environment may result from man's purposeful regulation of his own surroundings.

While, as previously pointed out, the foregoing factors influence the occurrence and distribution of all clinical types of venereal disease, it is proposed in this discussion to consider them only in relationship to syphilis and gonorrhoea. A further delimitation in the scope of the present discussion is indicated in view of the different epidemiological and public health implications of early as opposed to late syphilis. As set forth by Moore[3], these differences stem from the fact that, for practical epidemiological purposes, syphilis is not one but two diseases. One of these, early syphilis, represents an acute infection. Infectiousness is concentrated largely within the first year, diminishing rapidly thereafter so that by the end of the fourth year the risk of transmission from one adult to another has almost, if not entirely, disappeared. The other, late syphilis (i.e. of more than four years'

duration), is a public health problem comparable in importance to such non-infectious conditions as hypertension and cancer.

At this point, certain important features of our present knowledge of organism, host and environment as they relate to early (infectious) syphilis and gonorrhoea will be reviewed briefly and considered in the light of practical application to control measures.

Agent Factors:

The biologic requirements of T. pallidum and N. gonorrhoeae determine the reservoir of infection, dictate the means of transmission, and materially affect the host-parasite reaction.

Presumably as a result of centuries of host wanderings, mutation and selective adaptation, these organisms have become established exclusively in the biologic orbit of man. Thus there are no reservoir hosts other than man and no known vectors in nature.

The same biologic characteristics also explain why these are diseases of intimate contact. As Stokes[4] has maintained with reference to T. pallidum "its sharply conditioned viability, virulence, and infectivity

has prevented an absolutely universal infection of the human race" and again[5] - "it is not a divine moral purpose, or a satanic punitive ingenuity that connects syphilis with genital activities, but a mere biological accident no more significant in the last analysis than the fact that potatoes grow in sandy loam".

Host Factors:

Whether or not man, as the reservoir of syphilis and gonorrhoea will transmit these infections to others depends upon: (1) the outcome of the complicated agent - host interaction, and (2) the habits and customs of the population.

The interaction of agent and host determines the stage of disease and thus its infectiousness. Thus, as stated by Clark[2], transmissibility in syphilis depends upon: (1) the duration of infection; (2) the presence of moist lesions; (3) the infectiousness of secretions; (4) tissue reservoirs of organisms; (5) intimate contact with the organism in sufficient numbers; and (6) accessible portals of entry in the susceptible individual which satisfy the biologic requirements of the organism.

The habits and customs of the population in so far as they influence sexual behaviour and promiscuity will obviously determine the opportunities for exposure to the specific organisms in question. High prevalence and high incidence rates usually are a reflection of high promiscuity rates since the frequency of infection varies directly with the frequency of exposure to these organisms.[2]

Environmental Factors:

In the broad sense, the environment may be considered as the sum total of the biological, physical and socio-economic forces acting on the host. Man's biological environment is, of course, created by his own kind and by his associated fauna and flora, microbial or otherwise. The fact, that for both T. pallidum and N. gonorrhoeae there are no reservoir hosts other than man and no known vectors, has already been stressed.

The effect of the physical environment (geography, climate, etc.) on the human host and his relationship with the treponeme has been shown by Hudson[6] to have altered the manifestations of infection under different

climatic circumstances to such an extent that patterns of this disease related to morphologically indistinguishable treponemes are given such different names as endemic syphilis, yaws, bejel, pinta, etc.

With regard to the socio-economic environment as it relates to syphilis and gonorrhoea, there have been many splendid expositions, too numerous to mention here, on the subject. It would appear, however, that the socio-economic environment and the forces arising in, and from it, is particularly conducive to the spread of venereal infection.

2. APPLIED EPIDEMIOLOGY

The object of epidemiology, as previously set out, is to provide the knowledge whereby the applications to the detection, prevention and control of disease, as well as the promotion and preservation of health, are derived. Put more simply, this means that the agent-host-environment relationship must be altered in a direction that will be favourable to the human host by strategic attack directed at each of the preceding

components of the whole problem. In this connection, it should be noted that the multiple and complex causes of syphilis and gonorrhoea make it necessary to take into account the many forces which operate before as well as after pathogenesis begins in the host. Hence it is necessary that preventive action be directed against the agent, the host, and the environment both before and after infection, so far as our present knowledge will permit.

The following schema, as modified from Leavell and Clark[7], summarizes the preventive measures available, and the point of application in the control of infectious syphilis and gonorrhoea.

The Agent:

(1) avoidance of disease - producing organisms by health education,

(2) prophylaxis - chemical, mechanical, and chemo-therapeutic,

(3) adequate treatment to destroy specific organisms.

The Host:

(1) sex education,

(2) preparation for marriage and parenthood including premarital and prenatal examinations as part of general checkup,

(3) avoidance of sexual promiscuity,

(4) case finding for early unrecognised infections (including contact investigation among contacts of recognised infections),

(5) adequate treatment and case holding for recognised infections.

The Environment:

(1) general improvement of socio-economic conditions and recreational facilities,

(2) eradication of commercialized prostitution and control of other facilitating processes,

(3) educational media showing early symptoms and the urgency for early diagnosis and treatment,

(4) adequate diagnostic, treatment, case holding and case finding facilities.

In the discussion which follows, it is proposed to consider in detail the epidemiologic responsibilities outlined above.

3. EPIDEMIOLOGIC RESPONSIBILITIES

From the foregoing, it will be noted that the reservoir of venereal infection comprises two groups: recognised infections and unrecognised infections. The

corresponding epidemiologic techniques are divided into those which aim to control the infectivity of recognised infections (case holding) and those which aim to locate and place under control the unrecognised infections (case finding).

Case holding:

The control of infectivity of the recognised infection commences with diagnosis and utilizes adequate effective treatment to establish and maintain non-communicability. This epidemiologic responsibility is known as case holding and its success depends upon the skill of the physician in treatment planning and in maintaining patient cooperation.

As a result of newer forms of therapy for both syphilis and gonorrhoea, the physician now has available a wider range of choice in both therapeutic preparations and schedules of therapy. In many instances, these newer types of therapy have made it possible to shorten post-treatment observation.

Even so, no single method of treatment can be expected to be satisfactory and adequate for all syphilis or gonorrhoea infections. Again, most schedules of treatment require more than one visit for treatment or

post-treatment examination. Under these circumstances, an assessment of the infection and of the possible patient cooperation must first be made before the choice of treatment is finalized. If this is not done, therapy may be misdirected, schedules may be interrupted, patient cooperation may be lost and most important of all, from the standpoint of venereal disease control, infectivity may not be controlled.

Although it is axiomatic that patient cooperation will depend largely upon the understanding between physician and patient, the fundamental causes of neglect of treatment are often ignored. Some of these are failure to explain the disease, its treatment and its communicability to the patient; failure to take the patient's economic problems and job into account; transportation difficulties; rough or discourteous handling of the patient; lack of privacy or poor techniques which cause pain. Surprisingly enough, patients usually have an explanation for separation from treatment, and their explanation is usually very reasonable to them, even although it may not seem quite so reasonable to others.[8]

Time spent in establishing an understanding with the patient will pay significant dividends in the form of patient cooperation. Both the control of the

recognised case and the discovery of related new cases depend upon the patient's understanding of the infection and its implications since it is the patient who will lead to many of these unrecognised cases. It is upon the patient that the epidemiologist depends for the names and locations of contacts.

Case finding:

The great volume of unrecognised infections is largely responsible for perpetuation of these diseases[2]. Case finding procedures planned with intelligent case holding objectives in view are the basic fundamentals of venereal disease control. Case finding, although it is one of the fundamentals of the program, is not an objective in itself[9]. If it is to be of any benefit to the community, it must lead to one or more of three conclusions: (1) better information as to the prevalence or incidence of infection; (2) the protection of the public health and (3) the treatment of the infected.

4. CASE FINDING MECHANISMS

Case finding mechanisms may be divided into four main groups:

(1) a high index of suspicion: the private physician,

the general hospital, and clinics other than venereal disease clinics, will find venereal disease among patients who come for care unrelated to this cause. The proportion of such patients found to be infected will vary considerably in different localities and different groups of patients.

(2) screen examinations: the range of occupational and social classes covered by routine examinations is very wide. As might be expected, routine or screening serologic tests bring in the bulk of the latent (symptomless) syphilis. However, a physical examination given in connection with the blood test can have value as a means of finding symptomatic syphilis. These procedures have the limitations that they do not detect the presence of syphilis in the highly infectious seronegative primary stage while in areas of low prevalence, they are wasteful and expensive in terms of money, effort and time expended. While screening for gonorrhoea does not have the wider applicability of serologic screening for syphilis, the method has been used, as in British Columbia, in female goal examination centres.

(3) education is an effective means of bringing large numbers of persons to voluntary treatment. As a result of intensive venereal disease educational programs, there

is generally noted - (a) an increase in the number of cases who come to physicians and clinics of their own initiative; (b) an increase in the number of cases reported by physicians; (c) an increased yield of patients with infectious syphilis and gonorrhoea (i.e. more of the members of the reservoir of infection are reached during and after intensive educational programs than were previously reached); and (d) an increasing facility in the planning and conduct of further educational efforts. Despite these many advantages, the educational process has limitations since - (e) it does not reach everyone; (f) presumably some venereal disease is symptomless in the early stages, and (g) individual persuasion is necessary to induce some persons to come for examination.

(4) contact investigation, which has been defined as "a selective process that brings to examination only persons exposed to known cases of syphilis"[10], although the method can also be utilised in gonorrhoea control. Contact investigation originates from basic principles in epidemiology and is theoretically perfect. From each person with early syphilis or gonorrhoea, information is obtained pertinent to the identification of all individuals in the same chain of infection, and these persons are persuaded to present themselves for medical

examination. The method is theoretically sound because of the incubation periods involved, the usually limited number of sexual contacts, and the relative insignificance of asexual contacts.

At this point the reader may be tempted to pursue certain enquiries regarding the effectiveness of these various case finding procedures, along the following lines: (a) Which is the best method of case finding? (b) How much emphasis should be placed on each method in a venereal disease control program? (c) What factors influence the efficiency of these methods?

The answers to these and other questions presuppose the existence of methods for quantitating case finding and are only to be found from a search of the literature for comparative and evaluative studies of experience. Since it is proposed to discuss the quantitation of case finding measures in some detail later in this thesis, further debate on these important questions might, with the reader's indulgence, be deferred and considered at the same time. This arrangement will avoid digression into case finding generally and permit concentration upon the present field of study - contact investigation.

5. CONTACT INVESTIGATION

The first three of the four mechanisms described above pertain to case finding in its mass aspects, as opposed to the fourth - individual case finding, contact tracing or contact investigation. This procedure, as has been previously pointed out, stems from fundamental principles in epidemiology and originated the present-day emphasis on the epidemiologic approach to venereal disease.

Theory:

From the standpoint of prevention and control of communicable diseases generally and the welfare of the population, each occurrence of a new infection calls for a thorough enquiry into the sources and contacts concerned.

In venereal disease control, the patient on whom a diagnosis has been made must have acquired the infection from a pre-existing infectious case, who also may have spread infection to others. The patient may have had exposures to other persons between the time of acquisition of infection and establishment of diagnosis. From the practical viewpoint, the contact investigation process includes[11] all activities involved in (a) obtaining, from each person on whom a diagnosis of early syphilis

(or gonorrhoea) is established, information pertinent to the identification of all individuals who are possible members of the same chain of infection; and (b) inducing these persons through the mediums of field visits, telephone calls, letters, or through the efforts of the original patient, to present themselves for examination and, if necessary, treatment.

One aspect of contact investigation which is often ignored, and therefore worthy of mention at this time, is that the value of the procedure will probably be in direct proportion to the length of time by which the infectious period is shortened in those contacts who are infected[12]. Hence the necessity for prompt and speedy follow-up of contacts.

Historical Development:

As early as 1876, Sims in his Presidential Address to the American Medical Association suggested that the general principles for the control of communicable disease might profitably be applied to the control of syphilis -

"So far as the well-being of the human race is concerned, I look upon the subject of syphilis as the great question of the day. It was formerly a question of treatment, of mercury or no mercury. But that time has passed, and now it is a question of prevention, of

eradication, of the protection of the well against the contamination of the sick ... It is one of public hygiene and public health, and as such we are bound to meet it.

If yellow fever threatens to invade our precincts, we take steps to arrest its progress at once. If cholera sounds the alarm, we immediately prepare to defend ourselves against its ravages. If smallpox infests our borders, we circumvent and extinguish it. But a greater scourge than yellow fever and cholera and smallpox combined is quietly installed in our midst ...

To protect the public against its ravages, we must strike at the root of the evil. We must seek it out in its hot-beds, and circumvent it with such regulations as to prevent its transmission. We must ask for such laws as will confer upon us the power of dealing with this disease as we already possess with regard to cholera and smallpox ...

Thus you see that I would simply include syphilis in the great family of contagious or communicable diseases, and make it subject to the same laws and regulations that we already possess for their management"[13].

The present-day critic would probably be of the opinion that Sims' concluding suggestions were, to say

the least of it, optimistic. Such opinion would be based upon the accumulated experience of the eighty odd years which have since elapsed, and which have brought out the impossibility of controlling any communicable disease by legislation alone. However that may be, Sims' deserves credit for his suggestion of the application of well-defined public health principles to the control of syphilis.

In actual fact, however, prior to 1910 for lack of certain basic scientific discoveries, little or nothing could be done. These fundamental researches were those of Schaudinn (T. pallidum); Wassermann, Neisser and Bruck (serologic test); and Ehrlich (salvarsan). Once these basic discoveries were made, then the controllability of syphilis was established (Parran[14]), the science of public health venereology was born, and the contact investigator became one of its most important instruments.

Thus, in 1910, Bierhoff[15] of New York, though he apparently made no active attempt to bring the source under treatment indicated the possibilities of doing this. He noted that "the female prostitute, cohabiting with a number of men in quick succession, cannot trace the source of her disease. The woman who has intercourse with but one man, can easily do so. In the

male, it is possible, in by far the large majority of cases, to accurately fix the date of the infection and the source".

Four years later, L.W. Harrison[16], in giving evidence before the Royal Commission on Venereal Diseases in London, explained the importance of case reporting as an initial step in tracing the source of infection. At about the same time, isolated instances of attempts at contact tracing began to appear in the United States. Thus Shea[17] of Boston advocated that "the source of infection must be sought out, and this information can be furnished only by the patient". Varney[18] and his associates in 1916 detailed the part played by the social service department of the hospital in attempting to discover where and how syphilis patients acquire their infection and what other members of the family were exposed to infection. These authors stressed the legitimate purpose of the investigation which was to protect the innocent and, if possible, prevent the infection of others by getting at the source of the disease.

At Bellevue Hospital in New York City serious attempts were made before 1921 to investigate the source of every recent infection. Parounagian[19] in

discussing the management of syphilis cases there, pointed out that the aim of the epidemiologic problem is to "investigate every recent infection as to the source of infection and mode of transmission. If a married man comes to the clinic, we enquire as to the condition of his wife and ask him to bring his wife for an examination and often find her infected and place her under treatment. The women patients are urged to send their husbands or whoever may be responsible for the infection".

Practicability:

From about 1932 onwards, the studies of Munson in New York, and of Smith and Brumfield in Virginia, demonstrated clearly that, by the use of the epidemiological approach, undiscovered sources of infection could be found and brought under treatment.

According to Munson[20], an epidemiologist is "that creature who curiously combines a reasonable scepticism and insatiable curiosity with a passion for the truth and has the ability to recognise the truth when it looks him in the face, and with all this has the initiative to apply sufficient sole leather to the job to get the facts". He pointed out that syphilis does not spread evenly in the population, but that it is kept alive and spreads chiefly by a series of small epidemics.

Munson traced more than thirty such local outbreaks, averaging four or five cases each, most of which were not under treatment. By his technique of "sole-leather epidemiology", he thus demonstrated the practicability of contact investigation in epidemics in small communities.

Smith and Brumfield[21] (1933) noted that all of the facts necessary for an effective epidemiological attack against syphilis were known, at least to the point of practical application. It was their opinion, however, that the determination of sources of infection and the follow-up of contacts had not received due consideration - "These phases analogous to the carrier problems of other communicable diseases, have all but been completely ignored in practice and in the literature ... It has been assumed that the follow-up of contacts and the follow-back to the origin of the contagion is idealistic but impracticable, because patients will not divulge the names of sexual partners". On the basis of their contact tracing experience at the University of Virginia Hospital and Clinic, the authors denied that such was the case although they did emphasize both the patience, tact and energy necessary to successful performance of the task, and the important place of the physician in

these investigations which "probably cannot be done successfully by nurses or social workers alone"[22].

The nature of contact tracing epidemiologic control is well illustrated by the work of Brumfield and Smith which has produced the astonishing graphs of the intricate interchanges involved in the passage of syphilis from person to person - the so-called "transmission sequence of syphilis"[23]. Its practicability is shown by the fact that from 157 new cases of early syphilis which they studied, 345 contacts or potential sources were named (representing 278 individuals) of whom nearly one-half were located and brought to the clinic, and over one-third were found infected. Of the latter cases, all were in the early infectious stage of the disease and had not been under treatment previously.

By 1936, these methods which had been partly developed and tried in New York State had been considered to show "results sufficiently gratifying to warrant the state-wide application of the principle"[14]. At that time, the syphilis control program in the State, as described by Parran, had four major objectives:

(a) the notification of cases,

(b) intensive and complete investigation and supervision of sources of infection, cases and contacts,

(c) the provision of facilities for adequate diagnosis and treatment, and

(d) professional and public education.

For control purposes, the State (outside of New York City) was divided administratively into 33 districts, comprising the 12 major cities, 5 county health departments and 16 state health districts. The program was carried out by the city and county departments of health with State financial aid provided State standards were met. Outside of these major health jurisdictions, State-aid was given to local clinics but reports were made directly to the state district office and state personnel were used for epidemiological work.

In the same year (1936), an Advisory Committee to the U.S. Public Health Service recommended general adoption of the method along the following lines:[24]

"The venereal disease control section of a health department should, in order to provide adequate service, employ and supervise one or more medical follow-up workers on its own staff. It should also insist on the employment of, and provide for close cooperation with, similar workers attached to and under the supervision of subsidized clinics. The workers under the direct employ of the health department should offer service to non-subsidized clinics and to private physicians.

The medical follow-up worker is charged with two duties, each equally important:

(a) the epidemiologic investigation of the early infectious case, and

(b) the follow-up of patients lapsed from treatment, especially those with infectious venereal diseases.

By epidemiologic investigation is meant the tracing of infection of, and contacts with, infectious venereal disease patients and the provision for their examination and treatment if necessary. When a source of infection is discovered, all contacts with this case should, in turn, be traced ...

Where sufficient funds are available, all lapsed cases should be followed. If this is impossible, follow-up efforts should be concentrated on the lapsed patient who is actually or potentially infectious. It is particularly recommended that such follow-up services be extended by health departments to practising physicians, with due regard to privacy and professional secrecy."

Thus, for the first time in its history the venereal disease control movement gave full cognizance to the great importance of epidemiologic work in the control of the disease. Coincidentally, follow-up (case-holding), long a species of stepchild in the

majority of venereal disease clinics, received new and more serious recognition.

The actual implementation of these recommendations and the further development of the venereal disease control program was however delayed in many states because the limited funds available had to be apportioned among the many activities of a general public health program. Fortunately, a nation-wide effort at control was inaugurated in that year by Thomas Parran, then Surgeon-General, U.S. Public Health Service. His efforts led to the enactment by Congress, in 1938, of the National Venereal Disease Control Act. Under the terms of this statute devised:

> For the purpose of assisting states, counties, health districts, and other political subdivisions of the states in establishing and maintaining adequate measures for the prevention, treatment and control of the venereal diseases; for the purpose of making studies, investigations and demonstrations to develop more effective measures of prevention, treatment and control of the venereal diseases, including the training of personnel[25]

- there was provision for the continuing appropriation of Federal funds for venereal disease control, and the stimulation for similar appropriations by state and local communities. With these new funds, it was possible to lay the foundation of the modern venereal disease control program with its extensive case finding and contact investigation facilities, in the various states.

Technique:

From the practical viewpoint, if the epidemiologic approach is to be effective and further transmission of infection presented, the following requirements must be met:[26]

(1) the patient must be treated early,

(2) the patient must have some idea as to the whereabouts of his sexual intimates,

(3) he must be willing to divulge this information,

(4) the alleged contacts must be identified and located,

(5) the contacts must be persuaded to come to medical examination,

(6) if found infected, they must submit to treatment and further query concerning their contacts.

Despite these multiple barriers to successful contact investigation, the accumulated experience of workers in many venereal disease clinics has made it

possible to formulate some of the basic techniques.

As intimate sexual contact is usually responsible for infection, a friendly non-censorious approach to the patient in contact interviewing is necessary. On his first admission to the clinic every effort should be made to avoid stigma and ensure the confidential handling of the patient. In this connection the design of waiting-room and cubicle facilities, the use of numbers for identification, and the general attitude of the clinic personnel are all important. The contact interviewing must be undertaken in seclusion and privacy without interruption. Even so, the success of the interviewer depends greatly upon his personality and competence.

The contact interview may be carried out by physicians or public health nurses especially trained in the technique. However, the considerable shortage of public health nurses and experience gained from the Armed Forces has encouraged the use of lay investigators (e.g. in both New York State and British Columbia). Persons with a college degree, preferably in the pre-medical or social sciences, or its equivalent and suitable postgraduate experience are selected for either in-service training or a short training course at special

Interviewer Training Schools. The author has met several such investigators and was impressed by their enthusiasm and with their understanding of patients' psychology.

The method adopted at the interview may vary with the patient's attitude and the interviewer's approach. The basic principles include:

(1) discussion of general topics to put the patient at his ease.

This part of the interview can be varied from a considerate, personal and "informational" approach to an investigation of the patient's sexual pattern.

(2) discussion of the nature, stage and treatment of his infection, perhaps with visual aids,

(3) full enquiry as to all sexual and familial contacts during the epidemiologically significant period.

The different methods available in the approach to the patient have been evaluated to some extent. Thus the work of the Ingrahams has clearly shown the superiority of the persuasive approach over compulsion or enforcement tactics. Louise Ingraham[27] has aptly defined persuasion as "an offer of aid so convincingly extended and so helpfully applied as to earn willing acceptance" while the studies of both authors[26, 27] indicated that

the employment of a confidential persuasive approach to elicit a voluntary response from the patient, in the hands of a trained individual, was about half again as productive of usable epidemiologic information as was the untrained coercive approach. The voluntary response method was likewise found superior to compulsive methods in persuading the contact to submit to medical examination. Further, the value of reinterviewing selected patients to discuss contacts after a better acquaintance with the interviewer, was also demonstrated.

The commonest error is made in approaching the patient in an accusatory tone with the intent of finding - "Where did you get it?" Such an approach implies only one contact; it gives the patient an opportunity to accuse one of several contacts; it puts the patient on the defensive; it implies that the patient has been wronged; and it results in the patient divulging a single contact. The approach to the patient should not distinguish 'source' and 'spread' of infection. Only the identity of contacts is important, and any incriminatory suggestion must be avoided.

The marital partner is usually the first problem for the interviewer. The patient must be convinced of

the desirability of informing the spouse, and may be advised on what to say. There should be no false pretext used for bringing that contact to examination. Marital accusations must be prevented.

In the case of non-marital sexual partners, the patient must be impressed with the fact that only he knows the identity of the contacts and that it is his responsibility to ensure that they receive medical care. The patient's confidence must not be violated and under no circumstances should the contact be informed of the source of information.

While the patient may be given the opportunity of bringing his own contact (especially marital) to examination, if he wishes, in many instances the first approach to the contact will be by form letter or telephone call. In different areas, alternative devices e.g. registered letter or telegram may be used either initially or subsequently. If there is no response by the contact, then an investigator is immediately assigned to make a follow-up visit. Both in New York State and in British Columbia, epidemiologic workers are used in cooperation with public health nurses in the field. Needless to say, an effective contact investigation service demands enforceable health

legislation so that compulsion may be invoked for the recalcitrant in the infectious stage of disease.

The qualities which go to make a good contact tracer and the important place of this individual in present public health venereology have been ably described by Stokes.[28, 29] It is the author's experience and belief that good contact investigators are born and not made, for while the techniques can be taught much depends upon attitudes inherent in the person. In any event, the measures of the "natural" who does this work most successfully are the ability to establish good inter-personal relationships and to accept clues, however meagre, as ever a challenge to imagination and resourcefulness.

Economy:

Since the epidemiologic attack is concerned with mass phenomena, methods must be utilized which give maximum numerical returns for time, money and effort expended. The following are some of the more important considerations which enter into this aspect of contact investigation:

(a) Economy of contact investigation in terms of diagnosis and stage of disease in the original patient. All contacts of cases of venereal disease are not necessarily relevant to the problem of the case

in hand. Certain contacts are, however, of greatest importance, namely, persons who could have been the source of the infection in the new case and persons who may have been, in turn, infected by the new case. Such relevancy of contact can be assessed by considering the period of probable infectivity concerned.

Acute gonorrhoea is of short duration and although the incubation period may be of a few days only, contacts to the infected person during a period of one month previous to first symptoms may be significant. In the interviewing of females infected with gonorrhoea, contacts during the previous one to three months are usually included. That these relevancy periods for productive contact investigation in gonorrhoea stand in need of review, would appear indicated from previously published work of this author[30] and from the findings of this thesis.

In primary syphilis the period of relevancy is taken to be three months previous to the appearance of primary signs whereas in secondary syphilis, the period is six months prior to the onset of secondary manifestations. Examination of contacts (other than marital and familial) of patients with syphilis of more than one year's duration contributes little to

the control of this disease. Thus although there is evidence that some degree of infectiousness may persist for years in the latent syphilitic, the results of tracing contacts of latent cases indicate that such infectiousness is of slight degree compared to that of primary and secondary syphilis[12, 31, 32, 33]. It is true that discovery and treatment of a patient with latent syphilis may prevent disaster to that individual. Nevertheless, this accomplishment is relatively minor when compared to the good which results from interrupting the chain of infection from known early cases[34] and from concentration of epidemiologic activities upon the contacts of such cases[35]. These latter principles have been generally accepted as evidenced by the fact that in New York State contact investigation is limited to contacts of primary, secondary and early asymptomatic syphilis of less than one year's duration while the national contact investigation indices, as prepared by the U.S. Public Health Service, are based upon primary and secondary syphilis admissions.

(b) Economy of contact investigation in terms of investigative effort. Obviously, that investigative technique is most desirable which will yield the greatest return for a given expenditure of effort. There is

evidence that the returns per unit of effort expended, decrease as increasing amounts of effort are applied to the individual contact.[32] Especially is this true when the contact has been located and knows that he should report to the clinic for examination.[34] Yet a practical program must extend its activities to some degree along the scale of diminishing returns. The point at which further effort is not justified must be adjusted to the community involved and to the personnel and facilities available.

Role of the private physician:

Although much study has been devoted to the means by which official health agencies (state or provincial) can develop their methods of venereal disease control, only too frequently the role of the private physician in control programs has been minimized or disregarded entirely.

Thus the health agency may, within a defined area, do everything possible to control such disease. It may have excellent clinic facilities; it may have, in addition to competent venereologists, capable and well-trained public health nurses or contact investigators, all unexcelled in epidemiologic skill and effort, and yet ignore, or fail to enlist, the potentially important

contribution of the local private physicians.

It is a well known fact that many venereal disease cases are diagnosed by private physicians in the first instance; equally well known is the fact that little or nothing is done in the way of epidemiology in most of these cases. Yet epidemiologic study and contact tracing are as essential in cases diagnosed in the private office as in cases diagnosed in public clinics. The necessity for cooperation between private physician and health agency in both case reporting and contact investigation must be self evident.

Much of what has been said previously regarding the technique of contact interviewing holds true for the practising physician with his patient. Undoubtedly the physician is under an obligation to inform the patient of the dangers of the disease to himself and to his contacts. Failure to participate in this manner in contact investigation is failure to assume a medical responsibility. The average physician is understandably more concerned with the confidential relationship which should exist between patient and doctor than with the effect of the disease problem in the community. He finds it hard to accept measures which might shake the patient's confidence in him.[2]

Whether the private physician should be under legal obligation to participate in contact investigation may be considered a moot point. It is certainly interesting to read Rietz[36] on the essentials of the Scandinavian control of venereal disease, with his emphasis on the combined responsibility of the physician and the health authority for contact tracing. He makes the point that under the Swedish law of 1918, any physician treating a new case of infectious syphilis or gonorrhoea is required to inform the patient of the nature of his infection and of the danger of transmitting it to others. The attending physician is also obliged to ascertain from the patient the identity of the source of infection and to report both the case and source to the local health department.

At any rate, irrespective of whether such obligation should be legal or otherwise, effective epidemiologic control certainly points to the desirability of having private physicians cooperate with the official health agency to the extent of either personally interviewing their patients for contacts or consenting to have the investigator obtain the contact history. With the first alternative, the physician may then elect the responsibility for bringing the contact to examination

although more commonly, as with the second alternative, the investigator is requested to follow the contacts.

Attempts to develop such a joint activity of official health agency and private physician date back to the early 1930's. In 1933, Nelson[37] ventured to employ a trained case-worker to do contact and follow-up work in private practice. This project had but indifferent success since few physicians saw fit to use the service offered. Three years later (1936), an Advisory Committee[24] to the U.S. Public Health Service recommended that epidemiologic workers attached to state and local health departments should offer contact tracing service to private physicians. Within the past decade, a few limited studies have claimed successful participation of the private physician in this phase of venereal disease control,[38, 39] the cooperation of the physician having been enlisted through the offer of some health department service[39] (i.e. drugs, follow-up, consultation etc.). Good results are also reported to have followed the use of a single specially-trained investigator working exclusively with private practitioners.[40] In this latter arrangement, it is maintained that fixing the responsibility on one such person tends to protect the physician-patient relationship and thus make the private practising physician less wary of third party interference.

Studies designed to shed light upon performance in contact investigation by private physicians as compared with health department personnel pose special difficulties related to the collection and analysis of relevant data. On the basis of evidence presented in this thesis, however, it would appear that there is considerable room for improvement in the contribution which might be made by private physicians towards the contact tracing program.

6. STATISTICAL ASPECTS

Unfortunately, it is too often assumed that the useful contribution of statistics to disease prevention and control begins and ends with summaries and reports. This limitation is certainly not dictated by the scarcity of available data not by any lack of need to learn more about the peculiarities of the problem. It seems rather that full advantage is not taken of the contribution which statistical analyses can make to program planning and direction.

Statistics, thus applied, serve two purposes: they provide administrative personnel with data for direction of the program, and they facilitate operation. The basic statistics relate to morbidity, case-finding, diagnosis and treatment. Aside from their purely operational

necessity, statistics indicate groups and areas of high incidence and prevalence, thus locating the problem and providing data for directing control measures; they report activities, permitting evaluation of effort; and they provide information for reports to legislative bodies and the public, thus providing a basis for allocation of funds. With these objectives in view, the compilation of collected data is no longer a statistical endpoint but is rather only an initial step in the instigation of statistical studies which can direct control activities into more effective channels.

Similarly, in the planning and conduct of contact investigation, both case and contact data can be analysed for significant facts which can be utilised to extend our knowledge regarding the problem which is being faced, and about the individuals or groups of individuals involved. More specifically, contact investigation data are usually studied for one or a combination of the following objectives[41]:

(1) to determine the efficiency of contact investigation as a case-finding method,

(2) to compare the case-finding efficiency of contact investigation with that of other methods,

(3) to detect trends in the achievement of contact investigation,

(4) to compare success in different geographic areas in order to identify particularly efficient contact investigation techniques or personnel, and

(5) for general administrative guidance.

Although contact investigation was an established part of the syphilis control program in the United States from about 1936 onwards, little in the way of reliable data became available on the actual results, in terms of new cases of syphilis discovered, likely to be achieved.

The first index of appraisal of results was that of Turner, Gelperin and Enright[12] who suggested that the most reliable and applicable measure might be a ratio based upon the number of new infectious cases found per 100 patients with primary and secondary syphilis. These authors were careful to point out that proportions or ratios based on other figures might not be free from sources of error because the number of persons naming contacts and the number of contacts named might vary greatly in different clinics, according to different criteria for designating a contact as 'named' i.e. personal data available for identifying a contact vary

so much that it is often difficult to decide when a contact has been named. Unfortunately, no weight is given to the time element i.e. the length of time by which the infectious period is shortened in those contacts who are infected, in this index.

Statistical Indices:

An important advance in methodology came in 1948 when Iskrant and Kahn[41] of the U.S. Public Health Service, defined their statistical indices for use in the evaluation of syphilis contact investigation.

Their method of evaluation was based upon:

(a) the number of cases of syphilis in a particular diagnostic category (usually primary and secondary), diagnosed in a specified area in each calendar year,

(b) the number of contacts reported by these cases, and

(c) the disposition of the contacts.

In the analysis, four indices are calculated which broadly measure the effectiveness of the process: (1) contact index, (2) epidemiologic index, (3) brought to treatment index, and (4) lesion to lesion index. By way of clarifying the meaning of these indices,

the following example using fictitious figures based upon a sample of 1,000 cases of primary and secondary syphilis diagnosed in an area during one calendar year, may prove helpful:

Table 1

	Number	Index
Number of cases of previously untreated primary and secondary syphilis	1,000	
Number of contacts reported	2,316	
Contact index		2.316
Number of contacts infected with syphilis	689	
Epidemiologic index		0.689
Number of contacts with previously unknown syphilis	397	
Brought to treatment index . .		0.397
Number of contacts with previously unknown primary or secondary syphilis .	228	
Lesion to lesion index		0.228

(1) the contact index is the number of sexual contacts elicited per new case. Since this index is based upon all contacts named, regardless of the completeness of information, it measures the volume, but not the quality of contact reporting. Analyses done by the Venereal Disease Division of the U.S. Public Health Service have shown a direct correlation between accomplishment and the

volume of reporting - which indicates that the first requisite of effective contact investigation is a high index of contacts reported.

It is generally conceded that the contact index is valuable for preliminary evaluation of contact investigation programs and for current study to determine areas in which the emphasis on contact investigation has declined. Since it will be obvious that the contact index may be influenced by (a) failure to question the original case for contacts, or (b) poor interviewing technique with failure to elicit contacts despite the fact that the patient has been questioned - a further refinement, described later in this thesis, is to use some measure reflecting the percentage of reported cases questioned for contacts.

(2) the epidemiologic index measures the number of syphilis infections identified through contact investigation per new case reported - in other words, it evaluates the follow-up and examination of named contacts. It is an epidemiologic principle that for each new case of venereal disease discovered there exists in the community at least one other case of infectious venereal disease. If the disease continues to spread, there must be more than 'one for one'.

Therefore, through perfect contact investigation it should be possible to discover at least one infected person (the source) for each case reporting for treatment. In addition, it should be possible to locate all persons to whom the patient may have transmitted the infection. Quantitatively expressed, the minimum epidemiologic index should be unity, and when the disease is spreading, it should be greater than unity depending upon factors such as prevalence in the area and rate of exposure.

Iskrant and Rion[42] studied the association between the contact index and the epidemiologic index and concluded that the level of efficiency in contact investigation, as measured by the epidemiologic index, depends upon:

(a) a high contact index,

(b) a high percentage of successful locations and examinations, and

(c) a high percentage of infections in the group examined.

Since factors (b) and (c) were relatively constant from area to area examined, the variation in the epidemiologic indices was attributed largely to differences in contact indices. This indicates the

importance of improvement in contact interviewing in any effort to increase the efficiency of contact investigation as a case-finding method.

A point of practical importance in the calculation of epidemiologic indices, is the fact that the results of contact investigations completed outside the area (in which the original patient was diagnosed) are included. To some extent, therefore, the epidemiologic index for the area is determined not only by how well that area completes its own investigation, but also by the efficiency of other areas to which contact reports are referred for investigation. The epidemiologic index for an area also will be lowered to the extent that other areas fail to report back on contacts that they identify as being infected. In the New York State data which forms part of this thesis, a correction is made for this source of error, which has become considerable in recent years, in order to permit comparative evaluation of the intrinsic accomplishments of contact investigation within the various health jurisdiction of the state.

(3) The brought to treatment index is the number of new cases of syphilis found through contact investigation per reported new case. It should be noted that whereas the

epidemiologic index measures all infected contacts identified through contact investigation, whether previously treated or not, the brought to treatment index measures only the hitherto unknown cases found through contact investigation. The relationship of the latter to the former is of course affected by the level of other case-finding activities and by the readiness of the general population to seek diagnosis on the appearance of symptoms possibly syphilitic in nature.[41] There is no need to be discouraged if this ratio is low, so long as the epidemiologic index is high. Such a situation might well indicate that the other case-finding efforts in the area were very successful.

(4) the lesion to lesion index is the number of new cases of primary and secondary syphilis found through contact investigation per original reported primary and secondary case. This index evaluates the extent of community exposure since it is related to contacts with lesions. It also indicates that the period of community exposure was interrupted by treatment of contacts during actual infectiousness. Unfortunately, the time factor is not taken into consideration for early interruption of infectiousness is not reflected

in this index as it now used.

Evaluative Studies:

Indices comparable to the above have been worked out for many areas, and the range is very wide. Many factors must obviously enter into the establishment of high indices, such as availability of personnel, training and enthusiasm of investigators, actual interviewing techniques, preparatory education of the patients being interviewed, etc.

An example of the variations normally seen is given in the paper by Iskrant and Rion[42] who analysed accomplishment in contact investigation as reported by health agencies in twenty areas during the period, July to December 1946, utilising statistical indices. In these areas, the range in contact investigation was from 0.87 to 3.31 contacts named per original patient with primary or secondary syphilis; the epidemiologic index from 0.22 to 0.84 infected persons identified per patient; the brought to treatment index from 0.11 to 0.57 hitherto unknown cases found per original case; and the lesion to lesion index from 0.03 to 0.39 contacts with lesions present per original patient with lesions.

The most disappointing aspect of contact investigation, as revealed by these figures, is in the

low yields of all syphilis, and of primary and secondary syphilis. Since all admissions with primary and secondary syphilis offer opportunities to seek out source and spread contacts, why does not the process lead to discovery of more infected cases? As previously noted, the minimum epidemiologic index should be unity, and while the attainment of such a value might not bring about the complete eradication of syphilis, it would at least signify the achievement of a minimum goal. The figures given above show a range in the epidemiologic index from 0.22 in the lowest area to 0.84 in the highest. The fact that the latter figure approximates to unity and is 3.8 times the figure given for the lowest area, offers some hope that contact investigation could be improved. Similar considerations apply as regards the lesion to lesion index, with the range being from 0.03 to 0.39 and the highest area finding 13 times as many cases as the lowest. Since the epidemiologic index is a function of the volume of contacts reported, the key to such improvement obviously lies in the stimulation of contact reporting.

Important in the foregoing connection are the results of an experiment in contact investigation method, undertaken by the Arkansas State Board of

Health in cooperation with the U.S. Public Health Service, during the period March 31 - July 8, 1947. This study[35] was designed to discover what results might be achieved by contact investigation under conditions existing in most health departments, with certain changes in emphasis and procedure but with no additional personnel in local areas. The following changes from usual emphasis and procedure were adopted:

(1) concentration on syphilis: the Arkansas project was set up to concentrate all intensive epidemiologic activities on primary and secondary syphilis patients and their contacts. It was believed that 100 per cent activity applied to just this infectious group would be vastly more productive than investigation of contacts of later stages of syphilis,

(2) increased emphasis on interviewing: every effort was made to obtain the most complete and accurate contact information possible. To secure this result, investigators were provided with additional training and all patients were exposed to a group patient-education program,

(3) cooperation and coordination of interviewing and investigating: each investigator was made responsible for the interviewing of all cases of primary and secondary syphilis found in his area and provision was

made for the rapid and effective interchange of information between the informant, clinic epidemiologist, and the field investigators,

(4) importance of prompt location of contact: attempts were made to have each contact located and examined within four days of being named by the patient.

The results of contact investigation in the Arkansas experiment, as compared with results in the same area in a previous period, and with results achieved in other areas, are given below:

Table 2

	Contact Index	Percent of Reported Contacts Located	Percent of Examined Contacts Found Infected	Epidemiologic Index	Brought to treatment Index	Lesion to lesion Index
Arkansas experiment, 1947	3.26	79.8	63.6	1.61	0.83	0.47
Same area, Jan-Mar, 1946	0.69	64.7	66.3	0.30	0.11	0.06
⁄Highest previously reported	4.95	69.0	78.0	1.19	0.70	0.47

⁄ in any previous issue of the Statistical Letter, published quarterly by the Office of Statistics, Venereal Disease Division, U.S. Public Health Service.

It will be noted that during the experimental period the contact index was almost five times as great as that reported for the same area in a previous period, and a large part of the success of the program is attributed to the quality of the contact interviewing. The epidemiologic index of 1.61 was more than five times as high as that achieved in the same area in a previous period, and was the highest index reported up to that time. The brought to treatment and lesion to lesion indices increased eight-fold during the study period and were likewise the highest indices on record.

It was Heller[43] who pointed out, in his address to the 1944 National Conference on Venereal Disease Control, that "the contact investigation process is not an easy one". When one considers that conditions in the local areas covered by this experiment were anything but ideal from the standpoint of venereal disease control, and were not appreciably better than conditions to be found in most local health departments, then these achievement indices are truly remarkable. Perhaps more significantly, they demonstrate that the possibilities inherent in contact investigation are far from fully realised, let alone approached.

Before leaving the subject of statistical indices and their place in the evaluation of syphilis contact

investigation, the author would appreciate the opportunity to add some pertinent comments. In the first place, the whole significance of the work by Iskrant and Kahn lies in the fact that they developed a rational technique for the evaluation of contact investigation, which eliminated much of the variations in method which had existed earlier. In this connection, it is perhaps unfortunate that following any advance in knowledge, the heirs to such additional knowledge are prone to adopt it in slavish, and sometimes uncritical fashion. Thus, many of the subsequent proponents of the use of statistical indices for the evaluation of contact investigation have failed to take cognizance of additional factors important to evaluation, or additional variables relevant to analysis - many of which were noted by the original authors[41], and others of which have since assumed importance. In the New York State studies, included herewith, is described a further analysis of the contact investigation process, considered necessary for administrative guidance.

Secondly, there is to be noted a general failure to recognise the potential contribution of these indices to gonorrhoea control. It is true that the various state and territorial health departments

furnishing data to the U.S. Public Health Service, and the latter itself in its periodic Statistical Letters, issue summary reports on previously untreated gonorrhoea admissions, contacts obtained, and gonorrhoea contact indices. No attempt is made, however, to utilise the remaining contact investigation indices and there would appear to be at least three underlying reasons for the omission:

(a) health department preoccupation with, and concentration on, syphilis - considered to be the more serious disease,

(b) the notoriously incomplete reporting of gonorrhoea cases, and

(c) the fact that many, if not most, gonorrhoea cases are diagnosed in the first instance by private physicians who fail to report on, or follow through with, contact investigation. The latter part of this thesis, dealing with studies in the applied epidemiology of gonorrhoea undertaken in British Columbia, purports to show the value of statistical indices on a sex-specific basis for the evaluation of a modified program of contact investigation for the control of that disease.

Finally, it should be emphasized that where these achievement indices are used, the early location and treatment of infectious cases is more important than

the attainment of any mathematical index. The author has had difficulty on innumerable occasions in convincing others that these achievement indices and their mathematical values are not the answer to venereal disease control, but simply the tools by which the venereal epidemiologist quantitates the contact investigation process. One should not lose sight of the fact that reduction of the incidence of disease is the important objective; the indices are only mathematical indications of the degree of attainment of this objective.

Comparative Studies:

From what has been said previously regarding case finding mechanisms, it may be accepted that, apart from professional education aimed at engendering a high degree of suspicion in private physicians, hospital and clinic personnel, who may find venereal disease in patients coming for care unrelated to this cause, new cases fall into three large groups discovered as a result of the three well recognized methods of new case finding; (a) epidemiology or contact investigation, (b) lay education, (c) serologic screening. It is axiomatic that venereal disease control programs should give the requisite amount of attention to each of these three case finding procedures.

At this point, the three questions posed earlier and left unanswered, merit consideration. These questions were:

(a) Which is the best method of case finding?

(b) How much emphasis should be placed on each method in a venereal disease control program?

(c) What factors influence the efficiency of these methods?

The literature which might be expected to provide answers to these questions, falls into two classes:

(1) The studies of experience in terms of the achievements of contact investigation which analyze, or permit retrospective analysis of, their data on an absolute basis, using such statistical indices as contact index, epidemiologic index, brought to treatment index, and lesion to lesion index, all point to the crucial value of the epidemiologic approach (Table 3).

(2) On the other hand, the studies of experience which analyze their data in terms of the relative proportion of total cases of syphilis discovered as a result of contact investigation and other methods, uniformly indicate that the epidemiologic approach is the least productive of the major case finding methods (Table 4).

Table 3.

EPIDEMIOLOGIC STUDIES PERMITTING ANALYSIS OF THEIR DATA ON AN ABSOLUTE BASIS USING STATISTICAL INDICES TO MEASURE ACHIEVEMENT - PRIMARY AND SECONDARY SYPHILIS ADMISSIONS

	AUTHORS*			
	12.	31.	44.	35.
Primary and secondary cases diagnosed	247	204	269	201
Contacts reported	322	387	663	655
Contact index	1.30	1.90	2.46	3.26
Contacts infected with syphilis	174	258	-	324
Epidemiologic index	0.70	1.26	-	1.61
Contacts with prev. unknown syphilis	114	204	-	167
Brought to Treatment index	0.46	1.00	-	0.83
Contacts with prim. or sec. syphilis	74	147	172	94
Lesion to lesion index	0.30	0.72	0.64	0.47

* vide list of references

Table 4

EPIDEMIOLOGIC STUDIES ANALYSING THEIR DATA IN TERMS OF THE RELATIVE PROPORTION OF TOTAL CASES OF SYPHILIS DISCOVERED BY VARIOUS CASE-FINDING METHODS - PRIMARY AND SECONDARY SYPHILIS ADMISSIONS

Reason for coming to clinic	Authors*									
	45.		46.		47.		48.		49.	
	No.	%	No.	%	No.	%	No.	%	No.	%
Patient's initiative	39	10.1	68	46.3	1,194	57.1	200	55.0		64.2
Contact investigation	17	4.4	13	8.8	126	6.0	46	12.6	-	23.9
Other reasons	331	85.5	66	44.9	772	36.9	118	32.4		11.9
Totals	387	100.0	147	100.0	2,092	100.0	364	100.0	21,533	100.0

* vide list of references

The question naturally comes to mind whether these latter studies are a reflection of the true situation and, if so, is the clear logic of the epidemiologic approach merely a Utopian dream? One could argue that such an analysis gives only a relative measure of the contribution of contact investigation among all methods of case finding, for the percentage varies not only directly with how well contact investigation is being done but also inversely with the effectiveness of other methods of case finding. Thus, statements such as "contact investigation contributed only 10 per cent of the admissions with primary and secondary syphilis, and was the least productive in the number of admissions" do not absolutely evaluate contact investigation. They cannot be generalized upon, and applied to other areas. Ideally, contact investigation should only be quantitated on an absolute basis using statistical indices. Under such conditions, if contact investigation is good in an area, the indices will reflect this regardless of the extent and effectiveness of other case finding methods.

Fortunately, evidence with which to reconcile the conflicting results of these two classes of studies is available from the work of Wright and Sheps in North Carolina. These authors point out[50] that studies of the

latter type are usually based on a tabulation of the reason entered under the item on the clinic record - "Reason for Admission". They emphasize that this may be twice a source of error for the following reasons - (1) the item is usually checked by the clinic clerk who cannot be relied upon to take a consistent interest in this question and who often does not know the real reason for the patient's coming to the clinic, and (2) the term, "Reason for Admission" is not a clear cut one and is often interpreted in terms of the referral mechanism and not the "origin of the case", meaning the nature of the factor that separated the patient from the mass and brought him to recognition.

Wright and Sheps minimized these potent sources of error by endeavouring to make an accurate classification of the origin of each individual case, as elicited by a specially trained nurse. Based upon an analysis of the origin of 1033 cases of primary and secondary syphilis collected over a period of seven years, the following findings were recorded (Table 5):

(a) In infectious syphilis, contact investigation was responsible for 38.1 per cent of all cases, the patient's initiative for 42.6 per cent and all other methods for only 19.3 per cent.

Table 5

PERCENTAGE DISTRIBUTION OF ORIGIN OF 1,033 CASES OF PRIMARY AND SECONDARY SYPHILIS, BY SEX AND RACE, NORTH CAROLINA, 1941-1947.

Origin of case	Percentage				
	All cases	Male	Female	Negro	White
Patient's initiative	42.6	61.6	25.3	42.1	48.8
Contact Investigation	38.1	24.4	50.6	38.4	35.4
Other reasons	19.3	14.0	24.1	19.5	15.8
Totals	100.0	100.0	100.0	100.0	100.0

(b) In female infectious syphilis, contact investigation was by far the most important case finding procedure, being responsible for 50.6 per cent of all such cases. The importance of this observation is heightened by the fact that in female primary syphilis, contact investigation brought in 72 per cent of the negro and 75 per cent of the white cases.

(c) In male infectious syphilis, the educational process, as evidenced by the proportion of cases which came in due to the patient's initiative, was the most important case finding measure, being responsible for 61.6 per cent of the cases. Contact investigation was responsible for 24.4 per cent.

(d) Contact investigation was relatively more effective against negroes than whites, and

(e) the use of routine serologic screening procedures was the least effective of the three major case finding procedures in the control of infectious syphilis.

In summary, these authors believe that as a result of analysis of their data, contact investigation is of crucial importance as a case finding measure. They further point out that the method of analysis of such data which is usually used, has tended to obscure rather than to reveal the relevant facts. If accurate information on the relative effectiveness of the various

case finding measures is sought, then such knowledge can be obtained only by a careful analysis of the data pertaining to the origin of newly discovered syphilis cases in relation to specific groupings by race, sex, and type and stage of the disease.

It is probable, however, that categorical answers cannot be given to the first two of the three questions posed earlier - the choice of, and degree of emphasis to be placed upon, any individual case-finding method depending upon prevailing infection rates in the community and available facilities.[46, 51] Thus, as the prevalence of a disease decreases, routine or screen testing tends to lose its value as a means of case-finding. Obviously in an area of high prevalence the yield in terms of new cases will be high, but in an area of low prevalence the cost of finding cases through screen testing becomes prohibitive. Contact investigation is an instrument which can be used at any time in any area for finding new cases of venereal disease. Theoretically, it offers the perfect tool for breaking specific chains of infection and for this purpose should be equally effective and economical regardless of the prevalence of the disease. Its advantage over other methods is that it brings about the examination of

persons at the time they are potentially infectious. These persons may not respond to education because of the absence of symptoms, the failure to recognize symptoms, or the reluctance to present themselves for examination. Routine testing cannot detect the presence of the disease in the pre-lesion or open-lesion sero-negative stage and moreover, cannot be performed with sufficient frequency to detect a large proportion of infectious cases. In such cases, the timely discovery of a disease by contact investigation increases the patient's opportunity for cure by early treatment and reduces the danger to public health by a shortened period of infectiousness.

While much of the foregoing discussion pertains to the comparative evaluation of case finding measures for the control of infectious syphilis, broadly similar principles apply in gonorrhoea control. Since screening for gonorrhoea does not have the wider applicability of serologic screening for syphilis, case finding in gonorrhoea resolves itself into a matter of lay education and contact investigation. In the material which follows later in this thesis, case finding techniques for gonorrhoea will be discussed, with particular reference to the place of contact investigation

in the control of that disease. In both the syphilis and the gonorrhoea studies described herein, special importance is attached to the elucidation of factors which influence the efficiency of the contact investigation process and therein it is hoped that the reader may be able to find some, if not all, of the answers to the third question raised earlier.

OBSERVATIONS

STUDIES IN THE APPLIED EPIDEMIOLOGY

OF EARLY SYPHILIS

New York State

December 1950 - November 1951

Introduction:

Since 1936, the syphilis control program in New York State has had four major objectives:

(a) the notification of cases,

(b) intensive and complete investigation and supervision of sources of infection, cases and contacts,

(c) the provision of facilities for adequate diagnosis and treatment, and

(d) professional and public education.

For control purposes, the State (outside of New York City) is divided administratively into health jurisdictions, comprising the various city, county, and state health districts. In 1946, the first year of these studies, there was a total of 30 such jurisdictions, comprising 9 city health units, 7 county health departments and 14 state health district offices. By 1950, under a progressive program of decentralisation, some 36 health jurisdictions had been organised - 9 city health units, 12 county health departments and 15 state health district offices. The control program is carried out by the city and county departments of health with state financial aid provided state standards are met. Outside of these major health jurisdictions, the program is administered directly by the state district offices and

state personnel are used for the work. The overall supervision of the program is vested in the Venereal Disease Consultant, the senior staff member of the Bureau of Venereal Disease Control, New York State Department of Health. The function of this individual will be described in detail later.

In the brief space alloted, an effort will be made to provide a description of case-finding practices in the State. The hub of the case-finding program is the morbidity or case report and its ultimate repository, the central registry file of reported cases of syphilis within the state Bureau of Venereal Disease Control.

Under New York State law, all persons having knowledge of cases of venereal disease are required to report such information to the local health jurisdiction. Such reports, transmitted on a prescribed form, contain information about the patient and, in addition, provide for information concerning the contacts of the patient, if known, or if ascertainable. A provision of the health law requiring all clinical laboratories to report positive findings indicating venereal disease to the local health departments serves as a double check upon reporting and encourages cooperation by private physicians. Other important legislation contributing to the discovery of syphilis is the prenatal and premarital examination laws,

which provide that all pregnant women and all persons contemplating marriage receive serologic tests for syphilis. Other sources of morbidity reports are physicians, hospitals, clinics, Selective Service Administration, etc.

It will be seen therefore, that information concerning syphilis patients all flows into the local health departments. At this point, an important medical distinction is made between communicable or potentially communicable disease, and latent or late or non-communicable disease. Syphilis, when recently acquired, is communicable. However, after a person has had a syphilitic infection for several years, he or she is regarded for all practical purposes as being non-communicable. Since syphilis is usually acquired from other persons by sexual contact, and with knowledge of the period of probable infectivity concerned, it follows that the search for contacts is restricted to cases of recently acquired or early infections (defined for control purposes as primary, secondary or early asymptomatic syphilis of under one year's duration.)

The receiving health department physician scrutinizes all case reports for the purpose of making an initial sorting between cases of public health

significance i.e. early syphilis as defined above, syphilis in pregnancy, early congenital syphilis and those of latent or late syphilis. Cases in the former category are selected for intensive case-finding. It is the responsibility of the local health department to maintain a record of each case of early syphilis reported within its area, together with the names and dispositions of all contacts. In addition, the local health department is required to forward individual case reports to the State Bureau of Venereal Disease Control for retention in the central registry of syphilis cases.

Many physicians, clinics and hospitals in the state themselves engage in excellent case-finding activities, and patients are carefully interviewed for contact information. In many cases, field visits are made by personnel of the clinic or hospital. Where the physician or institution does not have facilities for such case investigative work, the various health departments offer their staffs of trained workers, thus making available to every treatment source in the state, all necessary epidemiologic service.

The substantial case load for field investigation, most of which devolves on the various health departments,

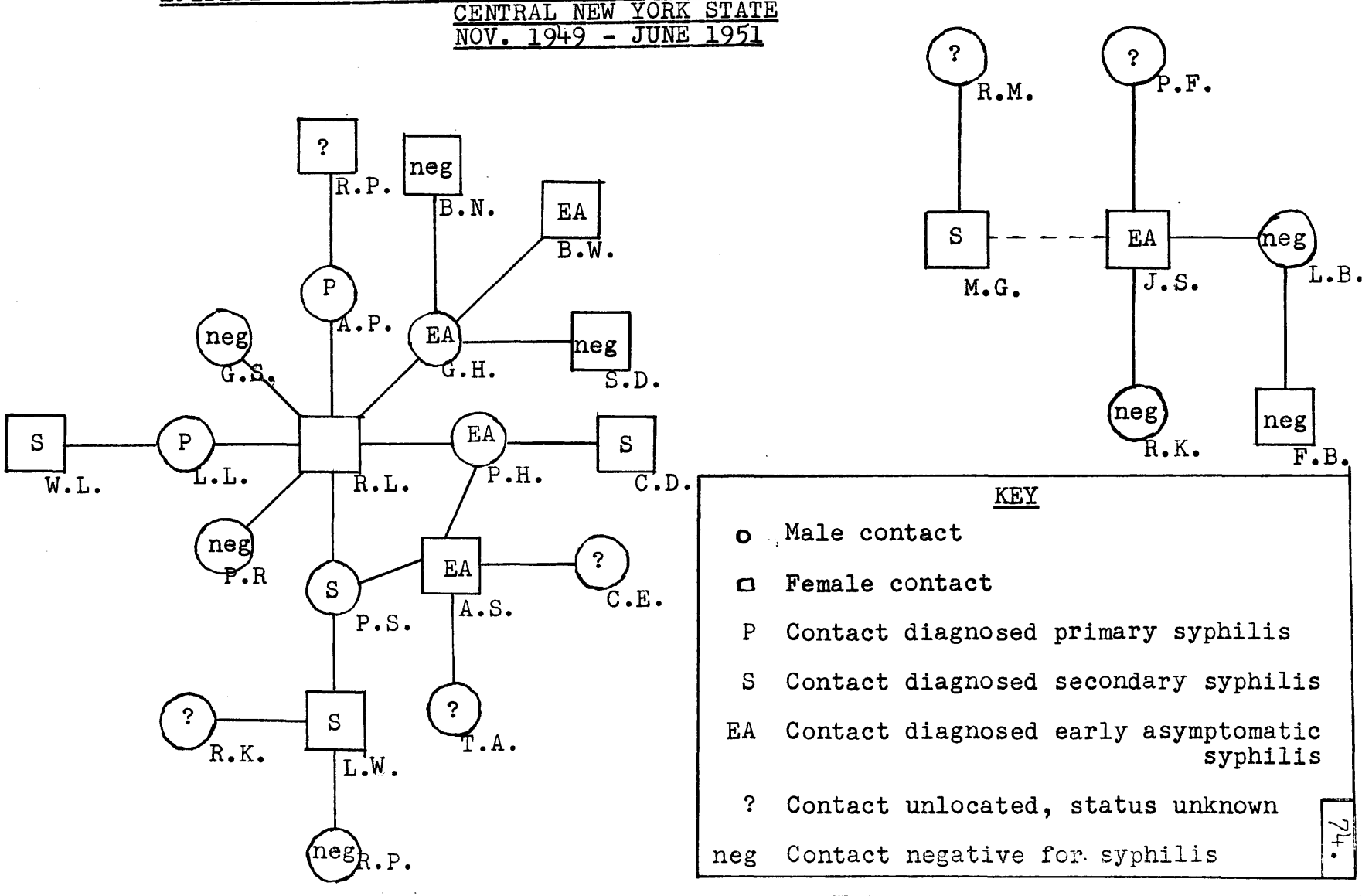
is the activity with which we are now concerned. The health department staff available for such work is composed of public health physicians, trained male investigators and hundreds of public health nurses in all areas of the state.

A perusal of an epidemiological investigation described below is perhaps the best way to give a picture of the problems and situations encountered in the contact investigation process (Figure 1). This investigation of an outbreak of early syphilis in the Groton-Dryden area of central New York State was carried out by the author as a demonstration project to secure cooperation in measures of venereal disease control. It can be seen that this outbreak centred around the female identified as R.L. who was diagnosed syphilis, acquired, early asymptomatic in June, 1949; who defaulted treatment and was not caught up with again, for a full course of treatment until December, 1950. Even this investigation was incomplete insofar as it failed to tie in the smaller group of seven individuals with the main outbreak, although it was felt that there was probably a common origin.

The foregoing episode leads naturally into an account of the other duties assigned to the author in his capacity of Venereal Disease Consultant to the

Figure 1.

EPIDEMIOLOGICAL INVESTIGATION OF AN OUTBREAK OF EARLY SYPHILIS
CENTRAL NEW YORK STATE
NOV. 1949 - JUNE 1951



KEY

o	Male contact
□	Female contact
P	Contact diagnosed primary syphilis
S	Contact diagnosed secondary syphilis
EA	Contact diagnosed early asymptomatic syphilis
?	Contact unlocated, status unknown
neg	Contact negative for syphilis

State Department of Health. Since these duties provided the opportunity to undertake the studies presented in this thesis they are best described by the following excerpt taken from the protocol outlining the duties of the appointment:

> "to act as venereal disease control consultant to county and city health departments and state district offices, and to do related work as required. Examples - to annually review the records of contact investigation of each case of early syphilis reported within the assigned area and compute indices of effectiveness of the procedure for each jurisdiction; to determine causes of defective yields of new cases and to advise measures designed to correct deficiencies thus discovered; to inquire into treatment administered for each reported case of syphilis, and to devise methods for improvement of treatment indices; to visit practising physicians throughout the area and to provide advice concerning diagnosis and treatment and to secure cooperation in measures of venereal disease control..."

The author was fortunate during the tenure of his appointment in having no particular assigned area for

his supervision so that the range of his activities covered the entire state. This circumstance permitted the accumulation of data on a state-wide basis. He personally assembled all of the data for the three years 1948-1950 and in addition carried out a retrospective analysis of the data in comparable fashion for the two preceding years, 1946 and 1947. The accumulated data for the five-year period, 1946-1950, forms the material upon which these epidemiologic studies are based.

Material:

Since 1936, the venereal disease morbidity reporting system has been on an efficient and reliable basis, eliminating to as great an extent as possible all duplications. Public health physicians have been available to consult with practitioners throughout the state on any phase of their venereal disease problems. This has tended to improve accuracy and completeness in reporting of syphilis - although gonorrhoea reporting still leaves much to be desired.

Table 6 presents the number of reported cases and rates per 100,000 population for early syphilis and gonorrhoea during the period 1936-1950. In 1936, 2,268 cases of early syphilis were reported with a

Table 6

NEW NOTIFICATIONS OF VENEREAL INFECTION AND RATES PER 100,000 POPULATION, NEW YORK STATE EXCLUSIVE OF NEW YORK CITY, 1936 - 1950

YEAR	EARLY SYPHILIS		GONORRHOEA	
	CASES	RATES	CASES	RATES
1936	2,268	38.5	7,899	134.2
1937	2,128	35.9	8,006	135.2
1938	1,706	28.6	6,233	104.6
1939	1,081	18.0	5,306	88.5
1940	1,011	16.8	5,070	84.2
1941	1,019	16.7	5,119	83.9
1942	1,151	18.6	4,520	73.2
1943	1,288	20.6	4,454	71.2
1944	1,344	21.2	5,339	84.2
1945	1,854	28.9	8,608	134.2
1946	3,063	47.1	10,060	154.8
1947	1,970	29.8	7,769	117.6
1948	1,235	18.3	5,882	87.4
1949	822	12.0	3,619	52.9
1950	508	7.3	2,896	41.6

rate of 38.5 per 100,000 population. In the same year 7,899 cases of gonorrhoea were reported, representing a rate of 134.2 per 100,000.

From 1936 to 1941, the number of reported cases of early syphilis fell to 1,019, the rate falling to 16.7 per 100,000. Syphilis was declining then in New York State at a fairly rapid rate even before the advent of penicillin. It is felt that this decline resulted, at least in part, from the comprehensive control measures instituted in 1936. During this period, the gonorrhoea case rate dropped from 134.2 to 83.9 per 100,000 population.

During the war period, 1941-1945, the problems of venereal disease control were multiplied enormously. As a result, the early syphilis case rate increased 73 per cent. Gonorrhoea rates which had continued to decline in 1942 and 1943, also rose steeply, by increasing from 71.2 per 100,000 in 1943 to 134.2 in 1945.

Following the close of the war, reports of communicable syphilis and gonorrhoea continued to mount until peak levels for these diseases were reached in 1946. Since then, there has been a steady drop in reported cases. By 1950, the early syphilis case rate had reached the lowest figure on record, 7.3 per 100,000

population - a figure rather less than half of the pre-war (1941) level. Gonorrhoea case rates declined to 41.6 per 100,000 in 1950 - approximately half of the 1941 level. Some of the probable reasons for this falling incidence are the utilization of penicillin and other antibiotics, improvements in diagnostic procedures, and intensification of public health control activities.

The spectacular reduction in reported cases of early syphilis which occurred in New York State after the end of World War II forms the background for the present research. During the five years under study, a total of 7,598 cases of early syphilis were reported to the state central registry of cases (Table 7). Since the objective was to evaluate contact investigation of newly reported cases of early syphilis, it was felt undesirable to include all reported cases. Cases were excluded from the study group if they had received previous treatment for the infection elsewhere (transfers - in) - since their contact histories would ordinarily be taken by the original source responsible for case diagnosis and reporting. Cases which had moved out of jurisdiction (transfers-out) were likewise excluded on the grounds of referral to the jurisdiction of new residence since experience has shown that the epide-

Table 7

PERCENTAGE OF EARLY SYPHILIS CASES THAT WERE REPORTED FOR INVESTIGATION*, NEW YORK STATE EXCLUSIVE OF NEW YORK CITY, 1946 - 1950

YEAR	CASES OF EARLY SYPHILIS	CASES REPORTED FOR INVESTIGATION	PERCENTAGE
1946	3,063	2,413	78.8
1947	1,970	1,704	86.5
1948	1,235	1,104	89.4
1949	822	703	85.5
1950	508	360	70.9
TOTAL	7,598	6,284	82.7

* Exclusive of those treated elsewhere, moved out of jurisdiction etc.

miologic and other indices of accomplishment in contact investigation are lowered by the failure of other jurisdictions to follow through with contact reports for investigation or to report back on contacts that they identify as being infected. These exclusions were considered necessary to permit evaluation of the intrinsic accomplishments of contact investigation as practised in New York State. It may be noted in Table 7 that for all cases of early syphilis reported during the 5-year study period, some 6,284 cases (82.7 per cent) were considered suitable for the evaluation of field investigation by health personnel. This percentage varied from year to year with a relatively smaller percentage in which investigation was indicated, for 1950. Such variations indicate that patient migration has been a considerable and changeable item in recent years and hence the necessity for consideration of this additional factor in evaluation studies.

Method:

In April of each year, the staff of the State Bureau of Venereal Disease Control prepares for each health jurisdiction, a listing of all early syphilis cases reported during the preceding year. The procedure

is not begun until April in order to allow a 90-day time lapse for the completion of outstanding contact investigations and the reporting back of all contact dispositions. This listing, known as the early syphilis case roster, is prepared on a worksheet (Table 8) with the names of the cases and columns 1-4 completed from the morbidity reports on file in the central syphilis registry. The roster is then used by the venereal disease consultant in his review of the records of contact investigation retained on each case of early syphilis within the various health departments. These health department records furnish the data for the completion of the remaining columns 5-35 on the worksheets.

By way of achieving some degree of uniformity in evaluating case-finding and case-holding activities on the early syphilis case roster, a standardised procedure is laid down as follows:

"Rules for scoring case-finding and case-holding from early syphilis case roster

1. Basis of scoring to be lists of cases reported by health jurisdiction during the year from central syphilis registry. Use checks (✓) only in columns re interview and in columns dealing with the treat-

Table 8.

EARLY SYPHILIS CASE ROSTER

Health Jurisdiction _____

Year 195_

Column No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Name	Sex	Race	Stage of disease	Date of report	Interviewed	No. contacts	Marital	No. contacts in H. District **	Good data	Insufficient data	0 - 1 mo.	1 - 2 mos.	2 - 6 mos.	Negative	Not located	Located, not examined	Positive	New infectious case	New non-infectious case	Previously known	Infectious	Non-infectious	Contacts outside H. District **	Good data	Insufficient data	Negative	Positive	Results unknown	Not located	Case placed under Rx	Penicillin - Hospital	Penicillin - oil	Positive	Observation maintained	Lost from observation
											Found	and	examined																						

** Health District - City, County or State

ment of the patient. Use numbers in all other columns.

2. The names of any cases reported during the year which do not appear on the list from the central syphilis registry should be added, and scored as are the others.

3. No case to be considered with reference to contact investigation if treated elsewhere than in the district prior to being reported, unless infectious relapse occurs in the district.

4. In columns concerning interviewing, "nurse" means a public health nurse, "physician" means the attending physician or his agent, and "other" will cover lay investigators, public health physicians, etc. Check one regardless of success of interview. If there is no record that the patient was questioned, enter 0 in the "nurse" column.

5. Under "Number of contacts" enter only contacts identified in some way, however poorly. Admission of sexual irregularities without attempt to identify in any way should not be counted as contacts - Count under this heading only contacts elicited from the patient, not those learned about from other sources. Include marital contacts in this

number. When two cases name each other as contacts, count only the one named first. A contact may be counted more than once when named by several persons.

6. Under "Marital", count only legal spouse, not common-law spouse.

7. Under "Number of contacts in district", count only persons living in the health jurisdiction.

8. Under "Good data", count that apparently sufficient for location of the contact, regardless of whether it was later found to be false or insufficient.

9. Under "Insufficient", count all contacts apparently identified so poorly that they could not be found, even although they may have later been found by another name.

10. Under "Found and examined", calculate the time from the date of receipt of the case report to the date of serological or other examination of the contact.

11. "Negative" refers to the outcome of examination of the contact - list here the number of patients found not to have syphilis, regardless of gonorrhoea.

12. The heading "Not located" refers to the named contact.

13. "New symptomatic early" refers to contacts not previously reported as cases who were diagnosed as primary or secondary. "New non-infectious" refers

to late cases and to cases of unknown duration, not previously reported, but not to early latent cases.

14. "Previously known symptomatic early" or "previously known asymptomatic early" or "previously known non-infectious" refer to contacts who had been reported as cases before being found as a result of contact investigation.

15. The group "Contacts outside district" refers to contacts living outside the health jurisdiction, not to the place of contact.

16. "Not located or no reply" refers to cases living outside the district whose diagnostic status is not known in the jurisdiction being scored.

17. The heading "Placed under treatment" and all subsequent headings refer to the treatment of the case named, not to the contact. "Placed under treatment" refers to any form of antisyphilitic therapy, whether initiated by physician or health department.

18. "Penicillin - hospital" refers to patients treated with penicillin whether at state expense or otherwise.

19. "Penicillin - oil" refers to patients treated on an ambulatory basis.

20. "Routine" means patient treated at weekly intervals.

21. "Observation maintained" means that the patient was examined at least three times during the twelve months following the case report, or within three months of the date of the review of the roster, if still under observation. If the patient is treated routinely, "observation maintained" means that he was known to have received at least 20 injections of an arsenical and/or heavy metal within a year, or that he was known to be under treatment within three months prior to the date of review of the roster.

22. "Relapse or reinfection" means serologic or clinical relapse or reinfection.

23. "Lost from observation" will cover all cases not classifiable as under observation in the previous columns".

Upon completion of all items on the syphilis case roster for the particular jurisdiction under review, the data are then tabulated on summary sheets (Table 9) to assist in the calculation of the following indices of contact investigation, treatment and post-treatment observation (Table 10).

Table 9.

CALCULATION OF INDICES OF CONTACT INVESTIGATION, TREATMENT AND POST-TREATMENT OBSERVATION

Health Jurisdiction _____
Year 195-

Item #		Race of Patient		
	All Races	White	Negro	Other & not stated
1. No. of reported cases				
2. No. of reported cases for investigation *				
3. No. questioned				
(a) by PHN				
(b) by MD				
(c) by others				
(d) total				
4. % questioned (total) (Item 3d ÷ Item 2 x 100)				
% of those questioned				
(a) by PHN (Item 3a ÷ 3d x 100)				
(b) by MD (Item 3b ÷ 3d x 100)				
(c) by others (Item 3c ÷ 3d x 100)				
5. No. of contacts elicited				
(a) by PHN				
(b) by MD				
(c) by others				
(d) total				
6. No. of contacts elicited per 100 reported cases suitable for investigation (Item 5d ÷ Item 2 x 100)				

	All Races	Race of Patient		
		White	Negro	Other & not stated
6. (a) questioned by PHN (Item 5a ÷ Item 3a x 100)				
(b) questioned by MD (Item 5b ÷ Item 3b x 100)				
(c) questioned by others (Item 5c ÷ Item 3c x 100)				
7. No. of cases with contacts in HD **				
8. No. of contacts in HD				
9. No. of contacts in HD per 100 cases with contacts in HD (Item 8 ÷ Item 7 x 100)				
10. No. of contacts in HD well identified				
11. No. of contacts in HD poorly identified				
12. No. of contacts in HD not located				
13. No. of contacts in HD located in 0-1 month				
14. No. of contacts in HD located in 1-2 months				
15. No. of contacts in HD located in 2-6 months				
16. No. of contacts in HD found negative				
17. No. of new symptomatic early cases among contacts in HD				

	All Races	Race of Patient		
		White	Negro	Other & not stated
18. No. of new symptomatic early cases among contacts of 100 cases of prim. and sec. syphilis naming contacts in HD (Item 17 ÷ No. of prim. and sec. cases x 100)				
19. No. of all new early cases among contacts in HD				
20. No. of all new early cases among contacts of 100 cases naming contacts in HD (Item 19 ÷ Item 7 x 100)				
21. No. of cases previously known symptomatic early among contacts in HD				
22. No. of cases previously known early (Pr. Sec. & EA) among contacts in HD				
23. Item 21 per 100 cases early symptomatic naming contacts in HD				
24. No. all early cases per 100 cases early (pr. sec. & EA) naming contacts in HD (Items 19 + 22 ÷ 7)				
25. No. of cases of syphilis (all stages) among contacts in HD				
26. No. of cases syphilis (all stages) among contacts in HD per 100 cases early naming contacts in HD (Item 25 ÷ Item 7 x 100)				

	All Races	Race of Patient		
		White	Negro	Other & not stated
27. No. contacts elicited outside HD				
28. No. contacts outside HD with early syphilis				
29. No. contacts outside HD with syphilis (all stages)				
30. No. contacts with early syphilis per 100 cases for investigation (Items 19 + 22 + 28 ÷ Item 2 x 100)				
31. No. contacts with syphilis (all stages) per 100 cases for investigation (Items 25 + 29 ÷ Item 2 x 100)				
32. No. of cases known to be under treatment				
33. % of reported cases for investigation known to be under treatment (Item 32 ÷ Item 2 x 100)				
34. No. of treated cases observed for 12 months				
35. % of reported cases for investigation known to be treated and observed for 12 months (Item 34 ÷ Item 2 x 100)				

* Exclusive of those treated elsewhere, moved out of jurisdiction etc.

** Health District - City, County or State

Table 10.

INDICES OF CONTACT INVESTIGATION, TREATMENT AND POST-TREATMENT OBSERVATION BASED UPON REPORTED CASES OF EARLY SYPHILIS AS USED IN NEW YORK STATE

BASE: Number of reported cases for investigation* (item #2) ....

1. OVERALL CONTACT INDEX (item #6)
   Number of contacts elicited per 100 reported cases .....

2. OVERALL EPIDEMIOLOGIC INDEX (item #31)
   Number of contacts with syphilis (all stages) per 100 reported cases .....

3. OVERALL EARLY CASE YIELD INDEX (item #30)
   Number of contacts with early (new plus previously known) syphilis per 100 reported cases .....

4. TREATMENT INDEX (item #33)
   Percentage of reported cases placed under treatment .....

5. OBSERVATION INDEX (item #35)
   Percentage of reported cases known to have been treated and observed for 12 months .....

BASE: Number of reported cases for investigation with contacts in health district** (item #7)...

6. LOCAL CONTACT INDEX (item #9)

   Number of contacts in health district per 100 cases naming contacts in health district...

7. LOCAL EPIDEMIOLOGIC INDEX (item #26)

   Number of cases of syphilis (all stages) among the contacts of 100 cases naming contacts in health district .....

8. LOCAL EARLY CASE YIELD INDEX (item #24)

   Number of all early (new plus previously known) syphilis cases among the contacts of 100 cases naming contacts in health district .....

9. LOCAL BROUGHT TO TREATMENT INDEX (item #20)

   Number of new early cases among the contacts of 100 cases naming contacts in health district .....

10. LOCAL LESION TO LESION INDEX (item #18)

    Number of new symptomatic early cases among contacts of 100 cases primary and secondary syphilis naming contacts in health district ...

---

* Exclusive of those treated elsewhere, moved out of jurisdiction etc.

** Health district - City, County or State.

By way of explanation, it should be pointed out that two sets of indices serve as measures for the evaluation of syphilis contact investigation in New York State. The first set of indices (overall indices) measures the overall work of the contact investigators in relation to a base consisting of all early syphilis cases considered suitable for investigation i.e. all early syphilis cases reported, with the exclusion of those who have received previous treatment elsewhere or who have moved out of jurisdiction. The second set of indices (local indices) evaluates contact investigation in relation to a base consisting only of those cases for investigation who name contacts residing within the same health jurisdiction.

The justification for having two sets of indices lies in the fact that the overall indices are of relatively little value in evaluating contact investigation techniques within a given health jurisdiction since in calculating overall epidemiologic and early case yield indices, the results of investigations completed outside the area are included. To some extent, therefore, these two indices for an area are determined not only by how well that area completes its own investigations, but also by the efficiency of other

jurisdictions to which contact reports are referred for investigation. The epidemiologic and early case yield indices for an area will also be lowered to the extent that other areas fail to report back on contacts that they identify as being infected.

In order to evaluate contact investigation techniques within a given health jurisdiction it is necessary to compute indices of effectiveness based upon activities which are the entire responsibility of that particular jurisdiction. The follow-up of contacts resident within the same health jurisdiction as that from which the original case was reported exemplifies such responsibility which can be evaluated by local indices based upon the number of such cases reporting contacts resident in the same jurisdiction. Where such a correction is made, this will usually be reflected in higher values for the contact, epidemiologic, and early case yield indices on a local, as compared with an overall basis.

The overall indices are of value in that they permit comparative analysis of contact investigation as between New York State, and other state and national figures. Use of local indices constitutes a refined technique which makes it possible to compare achievement

in different health jurisdictions in order to identify particularly efficient contact investigation techniques or personnel, or conversely to demonstrate weaknesses in procedures so that improvement may be effected. During the evaluation procedure as carried out in the various health jurisdictions, the educational aspects are stressed. Every effort is made to discuss individual cases with the health officer concerned; to explain the method of evaluation and indices of effectiveness used; to point out unsatisfactory findings as well as to advise both general and specific corrective measures.

Many of the points elaborated above are demonstrated, and the steps involved in the computation of overall and local indices are shown, in Table 11.

Results:

Table 12 presents the data relating to the distribution of cases in the study group in terms of stage of syphilis. A total of 6,284 cases were analysed. It will be noted that the percentage distribution of cases included in the study group varied from year to year according to primary, secondary, and early asymptomatic syphilis. Thus, whereas in 1946 primary and secondary syphilis accounted for 75.8 per cent, and early asymptomatic syphilis for 24.2 per cent of

Table 11.

ANALYSIS OF, AND CALCULATION OF APPROPRIATE INDICES FROM, EARLY SYPHILIS CASE ROSTER FOR ERIE COUNTY, 1950

Reported cases of early syphilis 103
less cases treated elsewhere 10

Reported cases suitable for investigation .. 93 (59 early symptomatic & 34 early asymptomatic)

Reported cases with contacts in county ..... 77 (49 early symptomatic & 28 early asymptomatic)

Disposition of contacts:	Contacts in county:	Contacts ex county:	Totals:
	181	37	218
Not located	59	27	86
Located	122	10	132
Negative for syphilis	68	7	75
Infected with syphilis	54	3	57
New symptomatic early	12	2	14
New asymptomatic early	5	1	6
Previously known early	16		16
New or previously known late	21		21

Reported cases under treatment 92
Reported cases treated and observed for 12 months 54

Overall indices:

Contact Index	=	218/93	x 100	=	234
Epidemiologic Index	=	57/93	x 100	=	61
Early case Yield Index	=	36/93	x 100	=	39
Treatment Index	=	92/93	x 100	=	99
Observation Index	=	54/93	x 100	=	58

Local indices:

Local Contact Index	=	181/77	x 100	=	235
Local Epidemiologic Index	=	54/77	x 100	=	70
Local Early Case Yield Index	=	33/77	x 100	=	43
Local Brought to Treatment Index	=	17/77	x 100	=	22
Local Lesion to Lesion Index	=	12/49	x 100	=	24

Table 12.

PERCENTAGE DISTRIBUTION, BY STAGE OF DISEASE, FOR CASES OF EARLY SYPHILIS REPORTED FOR INVESTIGATION*, NEW YORK STATE EXCLUSIVE OF NEW YORK CITY, 1946-1950

YEAR	PRIMARY		SECONDARY		EARLY ASYMPT.		TOTALS	
	No.	%	No.	%	No.	%	No.	%
1946	911	37.8	918	38.0	584	24.2	2,413	100
1947	552	32.4	626	36.7	526	30.9	1,704	100
1948	341	30.9	404	36.6	359	32.5	1,104	100
1949	212	30.2	246	35.0	245	34.8	703	100
1950	112	31.1	105	29.2	143	39.7	360	100

Table 13.

PERCENTAGE DISTRIBUTION, BY RACE, OF CASES OF EARLY SYPHILIS REPORTED FOR INVESTIGATION*, NEW YORK STATE EXCLUSIVE OF NEW YORK CITY, 1946-1950

YEAR	WHITE		NEGRO		OTHER		TOTAL	
	No.	%	No.	%	No.	%	No.	%
1946	1,545	64.0	836	34.7	32	1.3	2,413	100
1947	972	57.0	715	42.0	17	1.0	1,704	100
1948	574	52.0	520	49.1	10	0.9	1,104	100
1949	342	48.6	354	50.4	7	1.0	703	100
1950	172	47.8	183	50.8	5	1.4	360	100

* Exclusive of those treated elsewhere, moved out of jurisdiction etc.

cases for investigation, by 1950 the corresponding percentages were 60.3 and 39.7 respectively.

Table 13 shows the varying percentage distribution of cases in the study group, by race. It is seen that there was a progressive increase in the ratio of negro at the expense of white cases reported for investigation with other races accounting for a relatively small and constant proportion of the total case load.

The foregoing factors, by affecting the homogeneity of the data, undoubtedly influence the achievement indices for New York State, shown in Table 14. The material presented therein, is based upon early cases of syphilis reported in the state for individual years 1946-1950, the number of sexual contacts reported by these cases, the outcome of the investigations of the contacts, whether or not the cases were placed under treatment and if so, whether they received post-treatment observation. Analysis of the data is made on the basis of overall and local indices of contact investigation, treatment and post-treatment observation, as described earlier. The assembled data makes it possible to evaluate achievements in the state over the 5-year study period.

In the introduction to this thesis, it was pointed

Table 14

INDICES OF CONTACT INVESTIGATION, TREATMENT AND POST-TREATMENT OBSERVATION, BASED UPON EARLY CASES OF SYPHILIS, REPORTED IN NEW YORK STATE, EXCLUSIVE OF NEW YORK CITY: 1946-1950

	INDEX	1946	1947	1948	1949	1950
	Number of reported cases for investigation*	2,413	1,704	1,104	703	360
	Percentage of reported cases for investigation* questioned for contacts	85	95	97	91	94
1.	OVERALL CONTACT INDEX	93	97	105	124	147
2.	OVERALL EPIDEMIOLOGIC INDEX	59+	36	35	34	42
3.	OVERALL EARLY CASE YIELD INDEX	56+	30	27	23	27
4.	TREATMENT INDEX	91	94	95	91	95
5.	OBSERVATION INDEX	60	61	59	61	46
	Reported cases for investigation naming contacts in same health district**	1,128	835	573	351	205
6.	LOCAL CONTACT INDEX	129	134	135	164	189
7.	LOCAL EPIDEMIOLOGIC INDEX	61	61	56	55	60
8.	LOCAL EARLY CASE YIELD INDEX.	55	53	44	37	39
9.	LOCAL BROUGHT TO TREATMENT INDEX	41	32	32	25	24
10.	LOCAL LESION TO LESION INDEX.	-	32	36	19	19

* Exclusive of those treated elsewhere, moved out of jurisdiction etc.

** Health District - City, County or State.

\+ Contacts outside health district not reported back as negative, considered syphilitic

out that since the overall contact index is based upon all contacts reported, regardless of the completeness of information, it measures the volume, but not the quality of contact reporting. However, analyses done by the Venereal Disease Division of the U.S. Public Health Service have shown a direct correlation between accomplishment and the volume of reporting, which indicates that the first requisite of effective contact investigation is a high overall index of contacts reported.

It can be concluded from the foregoing that the overall contact index is valuable for the preliminary evaluation of contact investigation programs and for current study to identify areas in which the emphasis on contact investigation has declined. Further, since the analytical studies previously referred to, seem to show that the epidemiologic index is a function of the volume of contacts reported, then it would appear that the greatest improvement in the field of contact investigation can be obtained through better contact interviewing.

Since it will be obvious that the overall contact index may be influenced by (a) failure to question the

original case for contacts, or (b) poor interviewing technique with failure to elicit contacts despite the fact that the patient has been questioned, certain refinements in the analysis of contact interviewing are worth consideration.

A technique which may be adopted to correct for item (a) above is to use a measure reflecting the percentage of reported cases questioned for contacts, in conjunction with the overall contact index (Table 14). However, since the percentage of reported cases questioned for contacts, and the overall contact index for any given year are simply composite measurements of the achievements of many different health jurisdictions, it is preferable in the preliminary evaluation of contact investigation programs, to have the data available by individual health jurisdictions, as well as for the state as a whole (Tables 15, 16).

Poor interviewing technique with failure to elicit contacts despite the fact that the patient has been questioned, will also influence the success of the contact interview and hence the overall contact index. Since a successful contact interview involves the establishment of a good interpersonal relationship between the interviewer on the one hand, and the patient

Table 15

NUMBER AND PERCENTAGE QUESTIONED FOR CONTACTS, OF EARLY CASES OF SYPHILIS REPORTED BY HEALTH JURISDICTION, 1946 - 1950

HEALTH JURISDICTION	REPORTED CASES FOR INVESTIGATION*					PERCENT OF REPORTED CASES QUESTIONED				
	1946	1947	1948	1949	1950	1946	1947	1948	1949	1950
CITIES										
Binghamton	32	19	3	4	2	59	95	100	50	100
Mount Vernon	55	40	13	6	8	51	100	85	100	88
New Rochelle	29	26	14	10	3	7	69	93	100	67
Niagara Falls	52	39	26	21	5	96	100	100	100	100
Rochester	178	145	86	41	15	82	99	100	100	93
Schenectady	24	15	25	12	5	88	100	100	67	80
Syracuse	124	86	44	24	10	93	98	100	92	100
Utica	30	24	36	10	1	67	96	100	100	100
Yonkers	37	16	19	10	6	49	69	74	70	100
ALL CITIES	561	410	266	138	55	75	96	97	92	93
COUNTIES										
Albany	+	+	+	52	19	+	+	+	100	100
Cattaraugus	27	27	4	3	2	85	100	75	-	50
Columbia	11	14	7	5	1	82	93	86	100	100
Cortland	15	6	4	1	5	100	100	100	100	100
Erie	+	+	278	176	93	+	+	100	99	100
Nassau	111	93	71	39	21	86	86	94	97	100
Rensselaer	+	12	20	15	3	+	100	80	33	-
Schoharie	+	3	2	-	-	+	67	100	-	-
Suffolk	48	37	28	36	23	63	89	100	60	83
Tompkins	+	7	1	3	5	+	86	100	67	100
Ulster	14	13	7	4	7	79	100	86	75	71
Westchester	115	78	54	44	27	63	90	100	100	100
ALL COUNTIES	341	290	476	378	206	75	90	98	92	95
DISTRICTS										
Batavia	23	3	9	1	1	100	100	100	100	100
Binghamton	41	19	7	3	1	83	100	100	67	-
Geneva	21	8	16	4	1	90	75	94	75	100
Glens Falls	33	21	15	29	24	82	76	93	79	88
Hornell	89	58	36	29	16	97	100	97	97	100
Jamestown	34	34	11	7	6	94	88	73	100	100
Johnstown	17	8	2	5	1	100	100	100	60	100
Middletown	95	53	60	21	17	82	89	90	95	88
Oneonta	15	16	1	5	3	80	100	100	100	100
Poughkeepsie	24	15	18	12	3	100	100	94	42	100
Rochester	50	40	22	19	5	68	93	100	84	100
Saranac Lake	25	39	19	10	6	88	85	89	100	100
Syracuse	85	51	27	12	7	98	98	100	100	100
Utica	49	22	13	10	5	92	100	100	100	100
Watertown	+	+	19	20	3	+	+	100	100	100
ALL DISTRICTS	601	387	275	187	99	89	93	95	88	94
OTHER JDICTIONS	+ 910	617	87	-	-	92	98	100	-	-
Upstate N.Y.	2,413	1,704	1,104	703	360	85	95	97	91	94

* Exclusive of those treated elsewhere, moved out of jurisdiction etc.

\+ Health jurisdiction (s) organised subsequent to date of review.

Table 16.

CONTACTS ELICITED FROM, AND CONTACT INDICES BASED UPON EARLY CASES OF SYPHILIS REPORTED BY HEALTH JURISDICTION, 1946 - 1950

HEALTH JURISDICTION	CONTACTS ELICITED					CONTACT INDICES				
	1946	1947	1948	1949	1950	1946	1947	1948	1949	1950
CITIES										
Binghamton	19	16	2	2	-	59	84	67	50	-
Mount Vernon	28	16	9	4	5	51	40	69	67	63
New Rochelle	2	13	9	8	2	7	50	64	80	67
Niagara Falls	46	33	24	23	4	88	85	92	110	80
Rochester	173	194	103	57	14	97	134	120	139	93
Schenectady	15	9	13	4	5	62	60	52	33	100
Syracuse	117	65	50	43	30	94	76	114	179	300
Utica	22	19	50	10	2	73	79	139	100	200
Yonkers	14	8	11	7	4	38	50	58	70	67
ALL CITIES	436	373	271	158	66	78	91	102	114	120
COUNTIES										
Albany	+	+	+	63	12	+	+	+	121	63
Cattaraugus	18	22	2	-	1	67	81	50	-	50
Columbia	3	4	6	1	-	27	29	86	20	-
Cortland	14	8	2	2	5	93	133	50	200	100
Erie	+	+	317	228	218	+	+	114	130	234
Nassau	132	105	82	43	21	119	113	115	110	100
Rensselaer	+	4	8	5	-	+	33	40	33	-
Schoharie	+	3	-	-	-	+	100	-	-	-
Suffolk	24	15	17	17	19	50	41	61	47	83
Tompkins	+	15	2	3	5	+	214	200	100	100
Ulster	12	11	6	-	5	86	85	86	-	71
Westchester	67	120	129	197	112	58	154	239	448	415
ALL COUNTIES	270	307	571	559	398	79	106	120	148	193
DISTRICTS										
Batavia	18	6	5	-	1	78	200	56	-	100
Binghamton	35	10	3	1	-	85	53	43	33	-
Geneva	15	5	11	2	1	71	63	69	50	100
Glens Falls	22	9	11	21	12	67	43	73	72	50
Hornell	82	54	25	15	10	92	93	69	52	63
Jamestown	43	35	8	7	4	126	103	73	100	67
Johnstown	20	9	1	1	1	118	113	50	20	100
Middletown	104	47	52	14	7	109	89	87	67	41
Oneonta	13	22	-	14	3	87	138	-	280	100
Poughkeepsie	24	14	13	6	2	100	93	72	50	67
Rochester	33	38	16	8	3	66	95	73	42	60
Saranac Lake	30	40	13	9	6	120	103	68	90	100
Syracuse	104	37	24	13	8	122	73	89	108	114
Utica	73	26	22	16	6	149	118	169	160	120
Watertown	+	+	41	26	2	+	+	216	130	67
ALL DISTRICTS	616	352	245	153	66	102	91	89	82	67
OTHER J'DICTIONS	+928	620	73	-	-	102	100	84	-	-
Upstate N.Y.	2,250	1,652	1,160	870	530	93	97	105	124	147

\+ Health jurisdiction (s) organised subsequent to date of review.

on the other, various considerations on the part of both may influence the outcome.

Considerations on the part of the interviewer which may affect the information produced, include the personality, training, competence, enthusiasm, persistence, race, sex and type (v. infra) of interviewer. On the part of the patient - preparatory eduction received before interview, the kinds and amount of information possessed regarding contacts, the degree to which he can recall this information at the time of interview, race and sex, may determine the productivity of the interview.

It would be virtually impossible to assess the role and relative importance of each of these factors. However, from the administrative and operational viewpoint, and other things being equal, the all-important considerations are the type of interviewer (private physician, public health officer, public health nurse or lay investigator) and the race of the patient interviewed since New York State has a sizeable negro population.

Tables 17 and 18 present an analysis of contact interviewing by different types of interviewers and race of case interviewed, based upon early cases of syphilis reported in New York State, during 1946-1950.

Table 17.

CASES OF EARLY SYPHILIS REPORTED FOR INVESTIGATION*, AND CONTACTS ELICITED, BY RACE OF CASE AND TYPE OF INTERVIEWER, NEW YORK STATE EXCLUSIVE OF NEW YORK CITY, 1946-1950

RACE OF CASE AND INTERVIEWER	REPORTED CASES FOR INVESTIGATION*					CONTACTS ELICITED				
	** 1946	1947	1948	1949	1950	** 1946	1947	1948	1949	1950
WHITE:										
P.H. Nurses		378	217	109	59		446	259	152	62
Priv. Phys.		420	279	145	66		307	188	101	45
Others		129	57	47	37		158	66	74	68
Not Interv'd		45	21	41	10		-	-	-	-
Total	1,545	972	574	342	172	1,449	911	513	327	175
NEGRO:										
P.H. Nurses		397	291	189	56		443	362	290	96
Priv. Phys.		162	118	75	31		105	106	50	19
Others		115	95	67	87		176	176	200	238
Not Interv'd		41	16	23	9		-	-	-	-
Total	836	715	520	354	183	773	724	644	540	353
OTHER:										
P.H. Nurses		10	4	2	1		12	2	1	1
Priv. Phys.		4	4	3	2		2	1	2	-
Others		1	1	1	1		3	-	-	1
Not Interv'd		2	1	1	1		-	-	-	-
Total	32	17	10	7	5	28	17	3	3	2
ALL CASES:										
P.H. Nurses		785	512	300	116		901	623	443	159
Priv. Phys.		586	401	223	99		414	295	153	64
Others		245	153	115	125		337	242	274	307
Not Interv'd		88	38	65	20		-	-	-	-
Total	2,413	1,704	1,104	703	360	2,250	1,652	1,160	870	530

* Exclusive of those treated elsewhere, moved out of jurisdiction etc.

** Detailed data not available.

Table 18.

CONTACT INDICES FOR CASES OF EARLY SYPHILIS REPORTED FOR INVESTIGATION*, BY RACE OF CASE AND TYPE OF INTERVIEWER, NEW YORK STATE EXCLUSIVE OF NEW YORK CITY, 1946-1950

RACE OF CASE AND INTERVIEWER	CONTACT INDICES				
	**1946	1947	1948	1949	1950
WHITE:					
P.H. Nurses		118	119	139	105
Private Physicians		73	67	70	68
Others		122	116	157	184
Not interviewed		-	-	-	-
Total	94	94	89	96	102
NEGRO:					
P.H. Nurses		112	124	153	171
Private Physicians		65	90	67	61
Others		153	185	299	274
Not interviewed		-	-	-	-
Total	92	101	124	153	193
OTHER:					
P.H. Nurses		120	50	50	100
Private Physicians		50	25	67	-
Others		300	-	-	100
Not interviewed		-	-	-	-
Total	87	100	30	43	40
ALL CASES:					
P.H. Nurses		115	122	148	137
Private Physicians		71	74	69	65
Others		138	158	238	246
Not interviewed		-	-	-	-
Total	93	97	105	124	147

* Exclusive of those treated elsewhere, moved out of jurisdiction, etc.

** Detailed data not available.

Case-finding, whether it be effected by contact investigation or otherwise, and although it is one of the fundamentals of syphilis control, is not an objective in itself. If it is to be of any benefit to the community it must lead to prompt treatment of the infected and to the establishment and maintenance of non-communicability for the protection of the public health. Hence, all case-finding procedures must be planned with intelligent treatment and case-holding objectives in view.

The development of safe, rapidly effective and easily applied treatment methods for syphilis, if it has not virtually swept away the case-holding problem in that disease, has made it possible to shorten the period of post-treatment observation. Provided that treatment is available to all who stand in need of it, that adequate treatment is administered, and that patient cooperation can be assured during the most crucial period i.e. the year following the completion of treatment, then one has already gone a long way towards meeting the two objectives outlined above. Such is the avowed policy of the Bureau of Venereal Disease Control in New York State. In order to ascertain if these policy requirements are being met, on the review of the early syphilis case roster in each health jurisdiction, enquiry is made into the treatment

administered for each reported case of early syphilis and the adequacy of the follow-up during the year following diagnosis. From this procedure, indices of treatment and post-treatment observation are computed for the state as a whole and also for individual health jurisdictions (Tables 19 and 20).

By now, it must be obvious that the contact investigation process is affected by an infinite variety of circumstances, some of which have already been studied by means of overall indices of achievement. It therefore remains to describe some of the other differentials e.g. race and sex of case interviewed, and particular health jurisdiction involved, which enter into the analysis of contact investigation in upstate New York. The opportunity will also be taken to report upon certain time studies which have a bearing upon the results of contact investigation.

Since the proper study of these matters involves the determination of yields (as measured by epidemiologic and brought to treatment indices) from contact investigation, all the data henceforth considered are based upon reported cases of early syphilis naming contacts in the same health jurisdiction, and accomplishment is measured in terms of local contact, epidemiologic and brought to treatment

TREATMENT INDICES BASED UPON EARLY CASES OF SYPHILIS REPORTED, BY HEALTH JURISDICTION, 1946 - 1950

HEALTH JURISDICTION	REPORTED CASES UNDER TREATMENT					TREATMENT INDICES				
	1946	1947	1948	1949	1950	1946	1947	1948	1949	1950
CITIES										
Binghamton	21	19	3	4	2	66	100	100	100	100
Mount Vernon	53	36	11	6	7	96	90	85	100	88
New Rochelle	8	22	13	9	2	28	85	93	90	67
Niagara Falls	49	38	26	21	4	94	97	100	100	80
Rochester	174	141	85	39	15	98	97	99	95	100
Schenectady	23	15	25	12	4	96	100	100	100	80
Syracuse	122	79	43	23	10	98	92	98	96	100
Utica	28	23	36	10	1	93	96	100	100	100
Yonkers	21	15	17	8	6	57	94	89	80	100
ALL CITIES	499	388	259	132	51	89	95	97	96	93
COUNTIES										
Albany	+	+	+	49	18	+	+	+	94	95
Cattaraugus	25	27	4	3	1	93	100	100	100	50
Columbia	10	10	7	5	1	91	71	100	100	100
Cortland	15	6	4	1	5	100	100	100	100	100
Erie	+	+	278	169	92	+	+	100	96	99
Nassau	95	87	71	39	20	86	94	100	100	95
Rensselaer	+	12	16	13	3	+	100	80	87	100
Schoharie	+	3	2	-	-	+	100	100	-	-
Suffolk	12	4	2	14	18	25	11	7	39	78
Tompkins	+	7	1	3	5	+	100	100	100	100
Ulster	11	13	7	4	5	79	100	100	100	71
Westchester	89	78	54	44	27	77	100	100	100	100
ALL COUNTIES	257	247	446	344	195	75	85	94	91	95
DISTRICTS										
Batavia	23	3	9	1	1	100	100	100	100	100
Binghamton	39	17	7	3	1	95	89	100	100	100
Geneva	20	8	16	4	1	95	100	100	100	100
Glens Falls	22	18	14	24	24	67	86	93	83	100
Hornell	84	58	36	29	15	94	100	100	100	94
Jamestown	33	34	11	7	6	97	100	100	100	100
Johnstown	17	8	1	3	1	100	100	50	60	100
Middletown	89	50	58	19	17	94	94	97	90	100
Oneonta	15	16	1	5	2	100	100	100	100	67
Poughkeepsie	24	15	14	7	3	100	100	78	58	100
Rochester	46	40	18	19	5	92	100	82	100	100
Saranac Lake	23	35	16	10	6	92	90	84	100	100
Syracuse	80	49	25	9	7	94	96	93	75	100
Utica	43	22	11	9	5	88	100	85	90	100
Watertown	+	+	19	18	3	+	+	100	90	100
ALL DISTRICTS	558	373	256	167	97	93	96	93	89	98
OTHER J'DICTIONS+	882	594	87	-	-	97	96	100	-	-
Upstate N.Y.	2,196	1,602	1,048	643	343	91	94	95	91	95

\+ Health jurisdiction (s) organised subsequent to date of review.

OBSERVATION INDICES BASED UPON EARLY CASES OF SYPHILIS REPORTED, BY HEALTH JURISDICTION, 1946 - 1950

HEALTH JURISDICTION	REPORTED CASES KEPT UNDER OBSERVATION					OBSERVATION INDICES				
	1946	1947	1948	1949	1950	1946	1947	1948	1949	1950
CITIES										
Binghamton	18	15	-	3	2	56	79	-	75	100
Mount Vernon	31	15	6	6	4	56	38	46	100	50
New Rochelle	4	3	8	6	1	14	12	57	60	33
Niagara Falls	31	19	11	8	2	60	49	42	38	40
Rochester	139	113	75	35	12	78	78	87	85	80
Schenectady	19	7	10	5	4	79	47	40	42	80
Syracuse	64	45	16	14	5	52	52	36	58	50
Utica	20	19	30	6	-	67	79	83	60	-
Yonkers	21	15	14	6	-	57	94	74	60	-
ALL CITIES	347	251	170	89	30	62	61	64	64	55
COUNTIES										
Albany	+	+	+	29	6	+	+	+	56	32
Cattaraugus	7	24	1	1	-	26	89	25	33	-
Columbia	5	-	6	-	-	45	-	86	-	-
Cortland	12	5	3	-	2	80	83	75	-	40
Erie	+	+	217	139	54	+	+	78	79	58
Nassau	74	38	34	36	8	67	41	48	92	38
Rensselaer	+	8	14	3	3	+	67	70	20	100
Schoharie	+	2	-	-	-	+	67	-	-	-
Suffolk	5	1	-	4	7	10	3	-	11	30
Tompkins	+	6	1	1	5	+	86	100	33	100
Ulster	10	8	1	3	3	71	62	14	75	43
Westchester	40	51	51	44	27	35	65	94	100	100
ALL COUNTIES	153	143	328	260	115	45	49	69	69	56
DISTRICTS										
Batavia	7	1	2	-	-	30	33	22	-	-
Binghamton	25	13	6	2	-	61	68	86	67	-
Geneva	13	3	8	2	1	62	38	50	50	100
Glens Falls	9	5	6	7	2	27	24	40	24	8
Hornell	58	46	20	18	5	65	79	56	62	31
Jamestown	31	25	7	1	2	91	74	64	14	33
Johnstown	15	6	-	3	-	88	75	-	60	-
Middletown	41	25	14	17	2	43	47	23	81	12
Oneonta	14	12	1	3	1	93	75	100	60	33
Poughkeepsie	17	12	2	5	-	71	80	11	42	-
Rochester	39	36	10	6	1	78	90	45	32	20
Saranac Lake	18	23	9	2	1	72	59	47	20	17
Syracuse	51	27	11	4	2	60	53	41	33	29
Utica	34	21	6	6	1	69	95	46	60	20
Watertown	+	+	10	5	1	+	+	53	25	33
ALL DISTRICTS	372	255	112	81	19	62	66	41	43	19
OTHER J'DICTIONS+	576	391	41	-	-	63	63	47	-	-
Upstate N.Y.	1,448	1,040	651	430	164	60	61	59	61	46

+ Health jurisdiction (s) organised subsequent to date of review.

indices. As previously noted, this device is adopted to permit evaluation of the intrinsic accomplishments of contact investigation as carried on in the state, and to correct for the influence of incomplete or unreported contact investigations in lowering the epidemiologic and brought to treatment indices.

Table 21, and the summary thereof in Table 22, presents an analysis of contact investigation using local indices, by race and sex of case interviewed, for New York State during the period 1946-1950. In this study, the results are expressed in terms of contacts of the original patient.

Tables 23, 24, 25 and 26 reveal the individual accomplishments in contact investigation, as measured by local indices, of the 36 health jurisdictions in the state during the same 5-year period.

Finally, in view of the opinion previously expressed, that the value of contact investigation will probably be in direct proportion to the length of time by which the infectious period is shortened in those contacts who have syphilis, it would appear desirable to ensure the minimum lapse of time between the naming of the contact and the outcome of actual field investigation. Table 27 shows an analysis of the time taken (from naming to serologic or other examination of the contact) to bring to treatment

through contact investigation a total of 1,049 new cases of early syphilis during the five year study period.

Table 21.

LOCAL CONTACT, EPIDEMIOLOGIC, AND BROUGHT TO TREATMENT INDICES, BY RACE AND SEX OF CASE INTERVIEWED BASED UPON REPORTED CASES OF EARLY SYPHILIS HAVING CONTACTS IN SAME HEALTH JURISDICTION, 1946 - 1950

1946

	White		Negro		Other	
	Male	Female	Male	Female	/not stated	TOTAL
Cases with contacts in district	417	311	182	208	10	1,128
Local contacts elicited	516	457	226	249	12	1,460
LOCAL CONTACT INDICES	124	147	124	120	120	129
Local contacts infected	234	225	93	132	4	688
LOCAL EPIDEMIOLOGIC INDICES	56	72	51	63	40	61
Local contacts infected and not Previously diagnosed	190	142	59	67	3	461
LOCAL BROUGHT TO TREATMENT INDICES	46	46	32	32	30	41

1947

	White		Negro		Other	
	Male	Female	Male	Female	/not stated	TOTAL
Cases with contacts in district	241	214	162	210	8	835
Local contacts elicited	305	323	219	263	11	1,121
LOCAL CONTACT INDICES	127	151	135	125	138	134
Local contacts infected	145	140	106	114	7	512
LOCAL EPIDEMIOLOGIC INDICES	60	65	65	54	88	61
Local contacts infected and not previously diagnosed	94	89	41	45	1	270
LOCAL BROUGHT TO TREATMENT INDICES	39	42	25	21	13	32

Table 21 (cont'd)

1948

	White		Negro		Other	
	Male	Female	Male	Female	/not stated	TOTAL
Cases with contacts in district	154	106	152	160	1	573
Local contacts elicited	199	145	205	221	1	771
LOCAL CONTACT INDICES	129	137	135	138	100	135
Local contacts infected	69	65	85	103	-	322
LOCAL EPIDEMIOLOGIC INDICES	45	61	56	64	-	56
Local contacts infected and not previously diagnosed	44	40	51	46	-	181
LOCAL BROUGHT TO TREATMENT INDICES	29	38	34	29	-	32

1949

	White		Negro		Other	
	Male	Female	Male	Female	/not stated	TOTAL
Cases with contacts in district	86	61	89	113	2	351
Local contacts elicited	119	98	167	188	2	574
LOCAL CONTACT INDICES	138	161	188	166	100	164
Local contacts infected	34	38	60	61	1	194
LOCAL EPIDEMIOLOGIC INDICES	40	62	67	54	50	55
Local contacts infected and not previously diagnosed	17	15	32	23	-	87
LOCAL BROUGHT TO TREATMENT INDICES	20	25	36	20	-	25

Table 21 (cont'd)

1950

	White		Negro		Other	
	Male	Female	Male	Female	/not stated	TOTAL
Cases with contacts in district	48	38	49	69	1	205
Local contacts elicited	67	64	102	153	1	387
LOCAL CONTACT INDICES	140	168	208	222	100	189
Local contacts infected	29	16	36	43	-	124
LOCAL EPIDEMIOLOGIC INDICES	60	42	73	62	-	60
Local contacts infected and not previously diagnosed	18	7	14	11	-	50
LOCAL BROUGHT TO TREATMENT INDICES	38	18	29	16	-	24

Table 22.

LOCAL CONTACT, EPIDEMIOLOGIC, AND BROUGHT TO TREATMENT INDICES, BY RACE AND SEX OF CASE INTERVIEWED BASED UPON REPORTED CASES OF EARLY SYPHILIS HAVING CONTACTS IN SAME HEALTH JURISDICTION, 1946-1950.

INDEX	ORIGINAL CASE INTERVIEWED	1946	1947	1948	1949	1950
LOCAL CONTACT INDEX	White Male	124	127	129	138	140
	White Female	147	151	137	161	168
	Negro Male	124	135	135	188	208
	Negro Female	120	125	138	166	222
	ALL CASES	129	134	135	164	189
LOCAL EPIDEMIOLOGIC INDEX	White Male	56	60	45	40	60
	White Female	72	65	61	62	42
	Negro Male	51	65	56	67	73
	Negro Female	63	54	64	54	62
	ALL CASES	61	61	56	55	60
LOCAL BROUGHT TO TREATMENT INDEX	White Male	46	39	29	20	38
	White Female	46	42	38	25	18
	Negro Male	32	25	34	36	29
	Negro Female	32	21	29	20	16
	ALL CASES	41	32	32	25	24

Table 23

REPORTED CASES OF EARLY SYPHILIS HAVING CONTACTS IN SAME HEALTH JURISDICTION, BY HEALTH JURISDICTION, 1946 - 1950

HEALTH JURISDICTION	CASES & CONTACTS IN DISTRICT				
	1946	1947	1948	1949	1950
CITIES					
Binghamton	9	9	1	2	-
Mount Vernon	17	10	3	1	3
New Rochelle	1	6	4	5	2
Niagara Falls	20	10	12	11	1
Rochester	70	84	45	24	10
Schenectady	6	6	7	4	2
Syracuse	66	37	28	14	8
Utica	12	10	23	8	1
Yonkers	5	6	8	5	1
ALL CITIES	206	178	131	74	28
COUNTIES					
Albany	+	+	+	30	9
Cattaraugus	11	16	1	-	-
Columbia	2	2	5	1	-
Cortland	10	2	2	1	2
Erie	+	+	188	111	77
Nassau	51	49	41	16	8
Rensselaer	+	3	5	4	-
Schoharie	+	2	-	-	-
Suffolk	13	4	7	8	13
Tompkins	+	2	1	1	2
Ulster	6	5	4	-	1
Westchester	36	45	32	38	21
ALL COUNTIES	129	130	286	210	133
DISTRICTS					
Batavia	10	1	4	-	-
Binghamton	15	6	2	-	-
Geneva	10	3	7	1	1
Glens Falls	15	5	7	17	10
Hornell	45	32	13	4	7
Jamestown	20	19	5	1	3
Johnstown	11	7	1	1	-
Middletown	47	30	21	5	6
Oneonta	5	9	-	2	2
Poughkeepsie	8	4	7	2	1
Rochester	16	16	7	2	3
Saranac Lake	10	18	6	6	2
Syracuse	51	23	14	7	4
Utica	29	13	11	5	3
Watertown	+	+	14	14	2
ALL DISTRICTS	292	186	119	67	44
OTHER JURISDICTIONS+	501	341	37	-	-
Upstate New York	1,128	835	573	351	205

+ Health jurisdiction (s) organised subsequent to date of review.

Table 24

LOCAL CONTACT INDICES BASED UPON EARLY CASES OF SYPHILIS REPORTED BY HEALTH JURISDICTION, 1946 - 1950

HEALTH JURISDICTION	LOCAL CONTACTS ELICITED					LOCAL CONTACT INDICES				
	1946	1947	1948	1949	1950	1946	1947	1948	1949	1950
CITIES										
Binghamton	11	13	1	2	-	122	144	100	100	-
Mount Vernon	18	10	3	1	3	106	100	100	100	100
New Rochelle	1	6	4	5	2	100	100	100	100	100
Niagara Falls	22	12	13	12	1	110	120	108	109	100
Rochester	94	144	66	43	11	134	171	147	179	110
Schenectady	7	8	10	4	5	117	133	143	100	250
Syracuse	82	46	34	23	17	124	124	121	164	213
Utica	16	13	37	10	1	133	130	161	125	100
Yonkers	5	6	9	5	1	100	100	113	100	100
ALL CITIES	256	258	177	105	41	124	145	135	142	146
COUNTIES										
Albany	+	+	+	46	12	+	+	+	153	133
Cattaraugus	13	19	2	-	-	118	119	200	-	-
Columbia	2	2	5	1	-	100	100	100	100	-
Cortland	12	2	2	2	2	120	100	100	200	100
Erie	+	+	251	179	181	+	+	134	161	235
Nassau	66	61	50	18	9	129	124	122	113	113
Rensselaer	+	3	5	5	-	+	100	100	125	-
Schoharie	+	3	-	-	-	+	150	-	-	-
Suffolk	13	4	7	8	16	100	100	100	100	123
Tompkins	+	11	1	1	3	+	550	100	100	150
Ulster	10	8	4	-	1	167	160	100	-	100
Westchester	40	73	61	117	64	111	162	191	308	305
ALL COUNTIES	156	186	388	377	288	121	143	136	180	217
DISTRICTS										
Batavia	11	2	4	-	-	110	200	100	-	-
Binghamton	16	7	2	-	-	107	117	100	-	-
Geneva	12	3	8	1	1	120	100	114	100	100
Glens Falls	15	5	10	18	12	100	100	143	106	120
Hornell	67	40	18	4	7	149	125	138	100	100
Jamestown	29	24	6	1	3	145	126	120	100	100
Johnstown	11	8	1	1	-	100	114	100	100	-
Middletown	63	35	21	6	6	134	117	100	120	100
Oneonta	9	13	-	9	3	180	144	-	450	150
Poughkeepsie	11	4	7	2	1	138	100	100	100	100
Rochester	19	20	9	3	3	119	125	129	150	100
Saranac Lake	23	26	7	8	6	230	144	117	133	300
Syracuse	74	25	17	7	8	145	109	121	100	200
Utica	46	16	16	9	6	159	123	145	180	200
Watertown	+	+	31	23	2	+	+	221	164	100
ALL DISTRICTS	406	228	157	92	58	139	123	132	137	132
OTHER J'DICTIONS+	642	449	49	-	-	128	132	132	-	-
Upstate N.Y.	1,460	1,121	771	574	387	129	134	135	164	189

\+ Health jurisdiction (s) organised subsequent to date of review

Table 25.
LOCAL EPIDEMIOLOGIC INDICES BASED UPON EARLY CASES OF SYPHILIS REPORTED BY HEALTH JURISDICTION, 1946 - 1950

HEALTH JURISDICTION	LOCAL CONTACTS INFECTED					LOCAL EPIDEMIOLOGIC INDICES				
	1946	1947	1948	1949	1950	1946	1947	1948	1949	1950
CITIES										
Binghamton	5	4	1	2	-	56	44	100	100	-
Mount Vernon	10	7	2	-	1	59	70	67	-	33
New Rochelle	-	3	1	2	-	-	50	25	40	-
Niagara Falls	11	5	4	6	1	55	50	33	55	100
Rochester	34	49	23	16	3	49	58	51	67	33
Schenectady	6	3	5	2	2	100	50	71	50	100
Syracuse	33	23	10	7	8	50	62	36	50	100
Utica	8	9	16	5	-	67	90	70	63	-
Yonkers	3	4	2	1	1	60	67	25	20	100
ALL CITIES	110	107	64	41	16	53	60	49	55	57
COUNTIES										
Albany	+	+	+	17	7	+	+	+	57	78
Cattaraugus	6	10	-	-	-	55	63	-	-	-
Columbia	1	2	3	1	-	50	100	60	100	-
Cortland	9	1	-	-	-	90	50	-	-	-
Erie	+	+	96	64	54	+	+	51	58	70
Nassau	27	32	33	5	3	53	65	80	31	38
Rensselaer	+	1	5	4	-	+	33	100	100	-
Schoharie	+	1	-	-	-	+	50	-	-	-
Suffolk	2	-	6	5	5	15	-	86	63	38
Tompkins	+	1	-	-	2	+	50	-	-	100
Ulster	3	-	2	-	1	50	-	50	-	100
Westchester	19	41	25	20	10	53	91	78	53	48
ALL COUNTIES	67	89	170	116	82	52	68	59	55	62
DISTRICTS										
Batavia	9	-	1	-	-	90	-	25	-	-
Binghamton	13	4	2	-	-	87	67	100	-	-
Geneva	8	1	5	-	-	80	33	71	-	-
Glens Falls	11	5	3	8	5	73	100	43	47	50
Hornell	41	26	7	2	4	91	81	54	50	57
Jamestown	14	6	3	-	3	70	32	60	-	100
Johnstown	4	2	1	1	-	36	29	100	100	-
Middletown	25	19	15	4	3	53	63	71	80	50
Oneonta	2	4	-	2	3	40	44	-	100	150
Poughkeepsie	4	3	4	-	-	50	75	57	-	-
Rochester	6	10	5	2	3	38	63	71	100	100
Saranac Lake	10	12	2	3	1	100	67	33	50	50
Syracuse	34	15	8	1	2	67	65	57	14	50
Utica	17	9	5	4	1	59	69	45	80	33
Watertown	+	+	9	10	1	+	+	64	71	50
ALL DISTRICTS	198	116	70	37	26	68	62	59	55	59
OTHER J'DICTIONS+	313	200	18	-	-	62	59	49	-	-
Upstate N.Y.	688	512	322	194	124	61	61	56	55	60

+ Health jurisdiction (s) organised subsequent to date of review.

Table 26.

LOCAL BROUGHT TO TREATMENT INDICES BASED UPON EARLY CASES OF SYPHILIS REPORTED BY HEALTH JURISDICTION, 1946 - 1950

HEALTH JURISDICTION	LOCAL CONTACTS INFECTED & NOT PREV. DIAGNOSED					LOCAL BROUGHT TO TREATMENT INDICES				
	1946	1947	1948	1949	1950	1946	1947	1948	1949	1950
CITIES										
Binghamton	5	3	1	-	-	56	33	100	-	-
Mount Vernon	6	1	1	-	-	35	10	33	-	-
New Rochelle	-	1	1	1	-	-	17	25	20	-
Niagara Falls	10	1	2	6	1	50	10	17	55	100
Rochester	21	37	10	6	1	30	44	22	25	10
Schenectady	5	1	2	1	2	83	17	29	25	100
Syracuse	24	8	6	2	5	36	22	21	14	63
Utica	7	4	11	1	-	58	40	48	13	-
Yonkers	3	-	1	1	-	60	-	13	20	-
ALL CITIES	81	56	35	18	9	39	31	27	24	32
COUNTIES										
Albany	+	+	+	7	2	+	+	+	23	22
Cattaraugus	4	7	-	-	-	36	44	-	-	-
Columbia	1	-	3	-	-	50	-	60	-	-
Cortland	8	1	-	-	-	80	50	-	-	-
Erie	+	+	43	32	17	+	+	23	29	22
Nassau	25	14	24	1	1	49	29	59	6	13
Rensselaer	+	1	4	3	-	+	33	80	75	-
Schoharie	+	1	-	-	-	+	50	-	-	-
Suffolk	1	-	2	4	2	8	-	29	50	15
Tompkins	+	1	-	-	2	+	50	-	-	100
Ulster	2	-	1	-	-	33	-	25	-	-
Westchester	12	15	15	5	4	33	33	47	13	19
ALL COUNTIES	53	40	92	52	28	41	31	32	25	21
DISTRICTS										
Batavia	7	-	1	-	-	70	-	25	-	-
Binghamton	12	3	-	-	-	80	50	-	-	-
Geneva	7	-	3	-	-	70	-	43	-	-
Glens Falls	6	4	1	-	2	40	80	14	-	20
Hornell	34	22	4	2	2	76	69	31	50	29
Jamestown	12	5	1	-	3	60	26	20	-	100
Johnstown	4	-	-	1	-	36	-	-	100	-
Middletown	20	8	10	-	2	43	27	48	-	33
Oneonta	-	2	-	2	1	-	22	-	100	50
Poughkeepsie	4	1	2	-	-	50	25	29	-	-
Rochester	5	9	5	1	1	31	56	71	50	33
Saranac Lake	7	11	2	-	1	70	61	33	-	50
Syracuse	22	8	4	-	1	43	35	29	-	25
Utica	11	4	3	3	-	38	31	27	60	-
Watertown	+	+	6	8	-	+	+	43	57	-
ALL DISTRICTS	151	77	42	17	13	52	41	35	25	30
OTHER J'DICTIONS+	176	97	12	-	-	35	28	32	-	-
Upstate N.Y.	461	270	181	87	50	41	32	32	25	24

+ Health jurisdiction (s) organised subsequent to date of review.

Table 27.

PERCENTAGE DISTRIBUTION OF 1,049 NEW CASES OF EARLY SYPHILIS BROUGHT TO TREATMENT THROUGH CONTACT INVESTIGATION, ACCORDING TO TIME TAKEN TO BRING UNDER EXAMINATION AND CONTACT DIAGNOSIS 1946 - 1950

CONTACTS WITH NEW SYMPTOMATIC SYPHILIS

TIME FROM NAMING TO EXAMINATION	1946		1947		1948		1949		1950	
	No.	%	No.	%	No.	%	No.	%	No.	%
0 - 1 month	390	84.6	174	91.6	131	92.9	36	73.5	25	80.6
1 - 6 months	71	15.4	16	8.4	10	7.1	13	26.5	6	19.4
TOTAL	461	100.0	190	100.0	141	100.0	49	100.0	31	100.0

CONTACTS WITH NEW EARLY ASYMPTOMATIC SYPHILIS

TIME FROM NAMING TO EXAMINATION	1946		1947		1948		1949		1950	
	No.	%	No.	%	No.	%	No.	%	No.	%
0 - 1 month			67	83.7	34	85.0	29	79.3	15	78.9
1 - 6 months			13	16.3	6	15.0	9	23.7	4	21.1
TOTAL			80	100.0	40	100.0	38	100.0	19	100.0

Discussion:

In the preliminary analysis of the 6,284 cases included in the study group (Tables 12 and 13) it was noted that the percentage distribution of cases, varied from year to year according to stage of syphilis in, and race of, the patients.

The fact that the early asymptomatic cases increased in the percentage of total cases reported for investigation might reflect itself in the contact investigation process in the following ways - contacts would be proportionately fewer per case since great dependence cannot be placed upon the memory of sexually promiscuous patients regarding names of sexual contacts as the interval between sexual exposure and diagnosis lengthens; and contacts found infected would tend to be in the later stages of the disease, with consequently greater opportunity for diagnosis previous to being brought to treatment by contact investigation.

Again, the finding that there was a progressive increase in the ratio of negro at the expense of white cases reported for investigation over the years, would be reflected in the contact investigation process since

the studies described in Tables 21 and 22 reveal that more contacts are reported consistently per negro than per white patient, without a corresponding increase in the yield of contacts found infected and brought to treatment with new early syphilis.

Since these factors affect the homogeneity of the data and the achievement indices derived therefrom, care is necessary in interpreting time trends in New York State.

Examination of Table 14 reveals the following trends during the 5-year study period (1946-1950):

(1) a steady decline in the number of reported cases of early syphilis for investigation, from 2,413 in 1946 to 360 in 1950 (85 per cent decrease),

(2) during 1946, only 85 per cent of reported cases for investigation were questioned for contacts. This improved during 1947 and the improvement was maintained throughout the remaining years,

(3) a steady improvement in the number of contacts elicited per 100 reported cases (overall contact index) from 93 in 1946 to 147 in 1950 (58 per cent increase),

(4) the yield of contacts with syphilis (overall epidemiologic index) remained constant at about 36 contacts with syphilis per 100 early cases

investigated and reached a peak of 42 contacts with syphilis per 100 early cases investigated, in 1950 - over a period when the overall contact index increased 58 per cent,

(5) the yield of contacts with early syphilis (overall early case yield index) which declined to a low of 23 contacts with early syphilis per 100 early cases investigated, improved to 27 contacts with early syphilis per 100 early cases investigated in 1950,

(6) during 1946, only 91 per cent of early cases for investigation were placed under treatment. This improved during 1947 and the improvement was maintained, except for the year 1949,

(7) approximately 60 per cent of reported cases during the years 1946-1949 were known to have been treated and observed for 12 months post-treatment. In 1950, this percentage declined sharply to 46,

(8) a steady decline in the number of reported cases for investigation naming contacts in the same health jurisdiction, from 1,128 in 1946 to 205 in 1950 (82 per cent decrease),

(9) a steady improvement in the local contact index from 129 in 1946 to 189 in 1950 (47 per cent increase). The local contact index was 36 points more than the

overall contact index for 1946 (129 as compared with 93) and a similar spread was maintained throughout the five years,

(10) a consistent yield of approximately 60 contacts with syphilis per 100 cases naming contacts in the same health district (local epidemiologic index) - over a period when the local contact index increased 47 per cent,

(11) a decline from 55 to 39, in the yield of contacts with early syphilis per 100 cases naming contacts in the same health district (local early case yield index),

(12) a decline in the yield of previously unknown cases of early syphilis per 100 cases naming contacts in the same health district (local brought to treatment index) from 41 in 1946 to 24 in 1950.

(13) a decline in the yield of new symptomatic early cases per 100 cases primary and secondary syphilis naming contacts in the same health district (local lesion to lesion index) from 32 in 1947 to 19 in 1950.

These figures reflect a very creditable performance in the contact investigation process as carried on in New York State. Their importance is highlighted when one considers the actual numbers of individuals involved -

from a total of 3,092 reported cases naming contacts in the same health district during the 5-year period under review, a total of 1,049 new cases of early syphilis were brought to treatment through contact investigation (Table 26).

Ordinarily, with improvement in contact indices such as is manifest here, one would expect to see improvement in the epidemiologic and other indices of yield in contact investigation. This does not in fact occur, and is perhaps the most disappointing feature revealed in Table 14. It is probable that at least part of the explanation for this discrepancy is to be found in the operation of the two factors discussed earlier as affecting the homogeneity of the data.

In the broad perspective, it would appear that there is need for education of the public, in the first instance, so as to obviate delay in seeking treatment, hence leading to earlier contact interviewing. Secondly, there needs to be improvement in the quantity, and more especially the quality, of the contact data elicited from patients. Finally, there is need for the prompt follow-up of contacts so that infected individuals may be uncovered in the earliest stages of the disease, and communicability terminated by treatment in the shortest time possible.

So far as the results of actual contact interviewing are concerned (Tables 15 and 16), it is this type of evaluation which expresses statistically the adequacy of case-interviewing as a fundamental activity of any health jurisdiction in its role as a syphilis control agency.

In these tabulations, the number of contacts obtained is related to the number of reported cases of primary, secondary, and early asymptomatic syphilis, suitable for investigation. This relationship is that previously referred to as the overall contact index, which is used rather than the local contact index since it is obviously desirable in any health jurisdiction to elicit all of the contacts possible from patients, irrespective of whether they live in or out of jurisdiction (the latter can be referred to the jurisdiction of residence).

As was pointed out earlier, the first essential in contact interviewing is to ensure that the maximum number of cases are questioned for contacts. This means that in order to have a complete statistical account of contact interviewing, it is necessary to know what percentage of cases was questioned for contact information.

During the year 1946, the investigators were only able to question 85 per cent of the cases of early syphilis reported in upstate New York. This improved during the year 1947 and a high degree of success in questioning cases was maintained throughout the remaining years. For the city and county health departments as a whole, the success in questioning cases for contacts was even more pronounced for the latter years as compared to 1946. Insofar as the district health jurisdictions are concerned, the percentage of cases questioned was relatively high in 1946, and was maintained throughout the study period.

Among the individual health jurisdictions, the three city health departments of Niagara Falls, Rochester and Syracuse achieved consistently high percentages of cases questioned for contacts. The remaining six city health departments showed a spotty performance. Of the county health departments, Erie and Westchester Counties had a consistently good performance with sizeable numbers of cases to be questioned. The Erie County Health Department on its inception in January 1948, appointed a full time lay contact investigator and as a result had an enviable record of virtually 100 per cent of cases questioned for contacts during 1948-1950. In Westchester County, a full time lay investigator was appointed April, 1947 a step

which resulted in an immediate and lasting improvement in the questioning of cases for contacts.

When contact indices are considered, a progressive improvement in the volume of contacts elicited from case interviewing is apparent. For all early syphilis cases reported in the state, the overall contact indices were 93 in 1946, 97 in 1947, 105 in 1948, 124 in 1949, and 147 in 1950 - a 58 per cent increase during the quinquennium. For the cities and counties as a whole, there is noted a rising trend in the number of contacts elicited per 100 early syphilis admission. The city health departments increased their overall contact index from 78 to 120 - a 54 per cent increase during the study period. The greatest improvement in contact interviewing is displayed by the county health departments which more than doubled their overall contact index, to reach a high of 193, between 1946 and 1950. By contrast with the foregoing, the district health jurisdictions revealed an unsatisfactory performance with a 34 per cent decrease in the volume of contacts reported per 100 early syphilis admissions during the same period.

Upon consideration of the achievements of the individual health jurisdictions, and if one takes as the minimum acceptable standard of performance an overall

contact index of 100 i.e. one contact per each reported early case, it is apparent that only three health departments (Syracuse City, Erie County and Westchester County) would be rated as top performers, with another six health departments (Utica City, Rochester City, Tompkins County, Cortland County, Nassau County and Utica District) showing satisfactory performance.

Perhaps even more revealing is a comparison of the performances of the individual health departments rated against performance in the state as a whole. Whereas in 1946, of the 30 health jurisdictions which admitted cases of early syphilis, 11 equalled or surpassed the upstate New York overall contact index, in 1950 only 4 surpassed the state figure. The high overall contact index attained in 1950 is obviously due to the contact interviewing performance of but a few areas, notably Syracuse City, Erie and Westchester Counties.

It can be stated from the foregoing analysis that although there has been general improvement in contact interviewing in upstate New York over the years 1946-1950, that still greater efforts need to be made. More specifically, it is necessary that more effective techniques be adopted (a) to assure a greater percentage of reported cases questioned for contacts; (b) to elicit

the names of a greater number of contacts per case; (c) to improve the quality of the contact information so as to assist in the location of named contacts; and (d) to improve the unsatisfactory performance of many of the individual health jurisdictions to levels approximating to, or bettering, those with the best performance to date.

The analysis of the results of contact interviewing by different types of interviewers and race of case interviewed, is presented in Tables 17 and 18. In these tabulations, the number of contacts obtained by different interviewers is related to the number of reported cases of primary, secondary and early asymptomatic syphilis suitable for investigation, by race. The results are again expressed in terms of overall contact indices to measure the volume of all contacts reported by patients. This type of analysis, with particular regard for the activities and abilities of health department personnel, is considered important for administrative guidance. In the data presented, the term "others" includes lay investigators and public health physicians.

A result of this evaluation is the knowledge that health department personnel are more effective contact interviewers than private physicians - a finding which holds true for white and negro patients considered

separately, as well as for all cases interviewed. The accumulated experience over the four years for which detailed data are available indicates that the private physicians secured an average of 70 contacts per 100 early syphilis cases of all races - a figure well below the minimum of 100 considered necessary for effective contact investigation. It is interesting to speculate upon the possible reasons for the failure of the private physicians to elicit more contact information. While this may be due partly to the interviewing physician's lack of interest, insufficient time, or poor interviewing technique, it is quite probable that a patient may feel more inclined to discuss his sexual activities with an impersonal interviewer rather than with his own physician whose respect he wishes to retain. A further point worthy of note is that during the 4-year study period, there was no improvement, as measured by overall contact indices, in the contact interviewing performance of private physicians. These findings must be construed as indicating the need for a program of professional education aimed at making the private physicians more aware of the potential importance of their contribution to contact investigation.

Public health nurses, on the other hand, achieved considerably better results in contact interviewing than did the private physicians. For all cases interviewed, the public health nurses achieved overall contact indices of 115, 122, 148 and 137 for individual years from 1947 to 1950. Over the same 4-year period, the public health nurses elicited an average of 131 contacts per 100 early syphilis cases of all races - an 87 per cent greater contact return than that attained by the private physicians. When the race of the case interviewed is taken into consideration, it is noted that the public health nurses were successful in improving their overall contact index for negro patients from 112 in 1947 to 171 in 1950 - a 53 per cent improvement. However, they failed to effect any improvement in their interviewing of white cases for contacts.

It would appear, therefore, that the public health nurse carrying out a generalised public health nursing program, has established her place in syphilis case finding in New York State. This is as it should be for one can produce several good reasons as to why the public health nurse should be effective in contact investigation: (1) the nurse has a good knowledge of her district,

(2) some of the contacts may be members of families already under nursing health supervision,

(3) the nurse has established a personal professional relationship in the community, and

(4) where contact information is valid, but incomplete, the information may be sufficient for the nurse to locate a contact within her jurisdiction.

Specialised lay investigators and public health officers as a group, have proved to be more successful than either public health nurses or private physicians, in interviewing for contacts in New York State. For all cases interviewed, this group achieved overall contact indices of 138, 158, 238 and 246 for individual years from 1947 to 1950. The accumulated experience over the 4-year period indicates that this group secured an average of 195 contacts per 100 early syphilis cases of all races - a 179 per cent greater contact return than the private physicians, and 49 per cent more than the public health nurses. When the race of the case interviewed is taken into consideration, it is apparent that the lay investigators and public health officers improved their contact interviewing performance over time, for both white and negro patients.

By way of additional comment on the foregoing, it

should be remarked that during the period covered by these studies, there were only two lay contact investigators working in upstate New York. One was a graduate registered nurse who, following special training at the U.S. Public Health Service Interviewer Training School, Alta, Ga., was appointed to the Erie County Health Department upon its inception in January, 1948. The other, really an undertaker to trade, qualified in this new line of endeavour by virtue of special training at the U.S. Army Venereal Disease Investigators' School, Tuskegee, Ala., and was subsequently appointed in April 1947 to the staff of the Westchester County Health Department.

Emphasis has earlier been placed upon the fact that case-finding, whether it be effected by contact investigation or otherwise, is not an objective in itself. If it is to be of any benefit to the community, then it must lead to prompt treatment of the infected and to the establishment and maintenance of non-communicability for the protection of the public health.

It is the policy of the Bureau of Venereal Disease Control in New York State to make treatment for syphilis freely available to all who stand in need of it; to

ensure that adequate treatment is administered to each and every diagnosed case; and to maintain post-treatment observation of the early case for a minimum of 12 months following diagnosis. The recognition that all case-finding procedures must be planned with case-holding objectives in view, and that both case-finding and case-holding are epidemiologic responsibilities, explains the inclusion of data pertaining to the treatment and post-treatment observation of all early cases of syphilis for investigation, in New York State (Tables 19 and 20).

For the state as a whole, during 1946, only 91 per cent of all such cases were placed under treatment. This improved to 94 per cent during 1947 and the improvement was maintained except for the year 1949. When the individual health jurisdictions are considered, it is noted that only one area - Suffolk County - had a poor record in having reported cases of early syphilis placed under treatment. From this analysis, it can be concluded that by and large the individual health departments appear to be aware of their responsibilities in the matter of arranging treatment for early syphilis infections.

A rather less favourable picture is revealed when the indices of post-treatment observation are analysed. For entire upstate New York, only some 60 per cent of all early syphilis cases reported for investigation during the

years 1946-1949, were known to have been treated and observed for 12 months post-treatment. In 1950, only 46 per cent of such cases were treated and followed for one year after treatment.

When the city and county health departments as a whole are considered, it is noted that low post-treatment observation indices in 1946 and 1947, were followed by two years (1948 and 1949) during which some improvement was effected with nearly two-thirds or more of all cases known to have received the required post-treatment observation. In 1950, however, the observation indices for all cities and all counties again declined to a low level.

Particularly unsatisfactory performance is recorded for the district health departments whose group observation index declined from 62 to 19 - a 69 per cent decrease - during the study period. Among the individual health jurisdictions, only Westchester County displayed evidence of an efficient case-holding program for treated early syphilis patients.

It is rather remarkable that when the individual health jurisdictions show such a keen sense of responsibility in arranging treatment for cases of early syphilis, that they do not follow through to anything

like the same extent with post-treatment observation. Apparently, once the public health emergency of arranging treatment for individual cases of communicable or potentially communicable syphilis has been met, then the various health departments tend to feel quite satisfied with the accomplishment, or alternatively, they do not feel that they can spare the personnel and/or time to pursue further case-holding activities. Since a period of one year is regarded by most venereologists as the very minimum of follow-up required for adequately treated early syphilis patients, then the need for an educational program to reacquaint health personnel with the basic principles and objectives of case-holding, at once becomes apparent.

The efficiency of contact investigation is perhaps best indicated by the returns of contacts (contact index); by the yields of contacts found infected with syphilis (epidemiologic index); and more especially, by the yields of contacts brought to treatment with new early syphilis (brought to treatment index). In the evaluation of certain other differentials which enter into the analysis of contact investigation in New York State, these three indices must be used - for reasons explained on page 109 - on a base consisting of 100 cases of early syphilis

naming contacts in the same health jurisdiction (local indices).

From the data pertaining to the analysis of contact investigation by race and sex of case interviewed, and in which the results are expressed in terms of contacts of the original patient (Tables 21 and 22), the following general conclusions can be drawn:

(1) during the period 1946-1947, more contacts were reported per white original patient than per negro,

(2) during 1948-1950, more contacts were reported per negro original patient than per white,

(3) during 1946-1950, more contacts were reported per female original patient than per male,

(4) during 1946-1950, more contacts were brought to treatment per white original patient than per negro,

(5) during 1946-1948, almost equal numbers of contacts were brought to treatment per male as per female original patient,

(6) during 1949-1950, more contacts were brought to treatment per male original patient than per female (in 1950, the yield from male original patients was double that for females).

This detailed study of local indices of contact investigation by race and sex of case interviewed, would

appear to indicate that the improvement in local contact indices which occurred over the study period, has been accompanied by a lowered quality of identifying information. Further studies of this type are obviously needed to point out specific ways in which contact investigation can be improved, and continuing analysis is needed to keep pace with changing conditions in the field.

Since one of the reasons for the study of contact investigation data is to compare success in different geographic areas in order to identify particularly efficient contact investigation techniques or personnel, an analysis of the accomplishments in 36 health jurisdictions in New York State during the period 1946-1950, is presented in Tables 23-26.

For New York State as a whole, it is noted that there was a steady improvement in the local contact index from 129 in 1946 to 189 in 1950 (47 per cent increase). Among the individual health jurisdictions in 1946, the number of sexual contacts elicited per 100 early cases with contacts in the same district ranged from 100 contacts in the lowest areas to 230 in the highest, the highest area securing 2.3 times as many contacts as the lowest. In 1950, the range in local

contact index was from 100 in the lowest areas to 305 in the highest, the highest area securing 3.1 times as many contacts as the lowest. During the entire 5-year study period, no area reported a local contact index below 100, the minimum necessary for effective contact investigation, and some areas showed very creditable achievements.

In the number of syphilis infections identified through contact investigation per 100 early cases with contacts in the same district, the local epidemiologic index, a consistent yield of approximately 60 infections is observed for upstate New York during the study period. For individual health departments in 1946, the range in this index was from 15 infections in the lowest area to 100 in the highest, the highest area identifying 6.7 times as many infections as the lowest. In 1950, the range in local epidemiologic index was from 33 infections in the lowest area to 150 in the highest, the highest area identifying 4.5 times as many infections as the lowest.

In the number of previously undiagnosed early syphilis cases brought to treatment through contact investigation per 100 early cases with contacts in the same district, the local brought to treatment index, the upstate New

York figures show a decline in yield from 41 in 1946 to 24 in 1950. When the individual health jurisdictions are considered for 1946, the range in this index was from 8 to 83, the highest area finding 10.4 times as many new early cases as the lowest. In 1950, the range in local brought to treatment index was from 10 to 100, the highest area finding 10.0 times as many new early infections as the lowest.

By means of local indices of contact investigation, it is therefore a simple matter to evaluate contact investigation techniques as practised within different health jurisdictions. The use of such indices is predicated upon the belief that only those activities should be measured which are the exclusive responsibility of the particular jurisdiction concerned i.e. the follow-up of contacts resident within the same health jurisdiction as that from which the original case was reported. It is readily apparent from the foregoing analysis that while some areas have shown very creditable achievements in contact investigation over the 5-year study period, that the performance of others leaves room for improvement.

It is generally agreed that the value of contact investigation will probably be in direct proportion to the length of time by which the infectious period is shortened

in those contacts who have syphilis. From the New York State data given in Table 27, it can be stated that from the observed experience over the 5-year study period, 80 per cent or more of contacts found to have new early syphilis (irrespective of stage) were brought to treatment through contact investigation within one month of the date of naming as a contact, and 100 per cent within six months - a cause and effect relationship too strong to be ignored especially in view of the fact that many of the contacts must have been unaware that they were infected.

Summary:

(1) This presentation comprises studies in the applied epidemiology of early syphilis carried out in New York State.

(2) The material upon which the presentation is based consists of a total of 6,284 cases of early syphilis reported for investigation in New York State during 1946-1950.

(3) The method depends upon the annual evaluation of the effectiveness of contact investigation in upstate New York health jurisdictions and the computation of statistical indices from the assembled data.

(4) The applicability of the method to the supervision of local syphilis control programs and to the evaluation of variables involved in syphilis contact investigation, is discussed in detail.

STUDIES IN THE APPLIED EPIDEMIOLOGY

OF GONORRHOEA

Province of British Columbia

October 1949 - November 1950

February 1952 - June 1956

Introduction:

The pattern of the venereal disease control organization in the Province of British Columbia is essentially similar to that in New York State with but few differences. Responsibility for the prevention, treatment and control of venereal disease is delegated to the Director of the Division of Venereal Disease Control, the Division itself having been first organized in 1936 under the Provincial Board of Health, but now constituting part of the Provincial Department of Health and Welfare.

The Division operates venereal disease clinics in the larger cities, city gaols and provincial prisons; maintains a central registry of reported cases; and cooperates closely with the local private physicians and hospitals as well as with other federal and provincial departments concerned with medical care e.g. Department of Veterans' Affairs, Indian Health Services, Mental Hospital Service etc.

Outside of the larger urban areas, the control program is carried out through the various provincial Health Units, working with the local physicians, and the communities which both serve.

Through the specially trained personnel of its Epidemiology Section, the Division of Venereal Disease Control offers contact investigation service upon cases diagnosed in the clinics, and the same service is made available to private physicians in clinic areas. Elsewhere, in Health Unit jurisdictions, local health personnel are used for this work, and assist the local private physicians upon request.

Under provincial law, physicians must notify all known cases of venereal infection to the Division of Venereal Disease Control either directly or through the local Health Unit. Notification is by name on a prescribed form which makes provision for both case and contact data.

Funds for the operation of the venereal disease control program are provided by the Provincial Government, supplemented by annual grants from the Federal Government.

Material:

During the past decade, British Columbia, in common with most other health jurisdictions in North America, has made substantial gains in reducing morbidity from venereal disease. These gains have been achieved since 1946, when the Province entered the post-war era with the highest rates for gonorrhoea and infectious (primary

and secondary) syphilis of any Canadian province. Since that date, the decline in the infectious syphilis rate has been truly remarkable but with gonorrhoea, the advances have been much less spectacular (Table 28). It is quite apparent that such successes as have been achieved for gonorrhoea are in no way comparable to those against infectious syphilis and hence gonorrhoea must now be considered the major problem facing our venereal disease control organization.

In view of the fact that British Columbia has made some advances in the control of gonorrhoea, it would appear reasonable to attempt an evaluation of these advances against progress in gonorrhoea control elsewhere. However, in attempting such evaluation, one is soon faced with the realization that there exists no true measure of the incidence and prevalence of this infection. Gonorrhoea reporting is notoriously incomplete and hence figures based upon morbidity reports can be used only as a partial and minimum indication of incidence and prevalence and, at most, to evaluate trends rather than to obtain the true picture of the gonorrhoea problem.

Trends in morbidity reporting of gonorrhoea from 1944 to 1955, for Canada and the continental United States are shown in Figure 2. It will be seen that for both

Table 28.

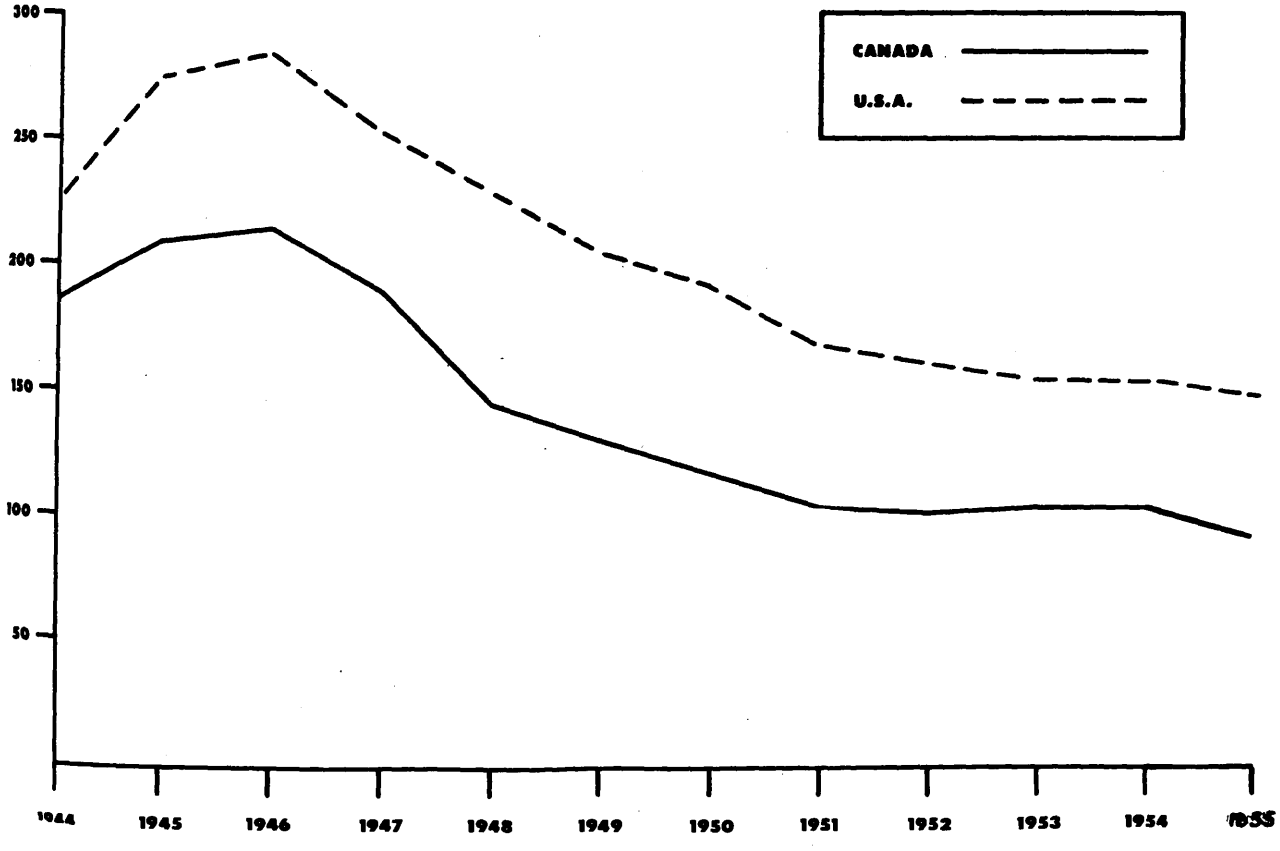
NEW NOTIFICATIONS OF VENEREAL INFECTION AND RATES PER 100,000 POPULATION, BRITISH COLUMBIA, 1944-1955

YEAR	GONORRHOEA		INFECTIOUS SYPHILIS	
	CASES	RATES	CASES	RATES
1944	3,358	360.3	380	40.8
1945	3,711	391.0	645	68.0
1946	4,618	460.4	834	83.2
1947	4,056	388.6	575	55.1
1948	3,608	333.5	239	22.1
1949	3,694	331.9	139	12.5
1950	3,627	319.0	61	5.4
1951	3,336	286.4	36	3.1
1952	3,098	258.6	33	2.7
1953	2,968	241.3	26	2.1
1954	2,668	210.7	17	1.3
1955	2,494	191.1	14	1.1

Figure 2.

GONORRHOEA
CANADA AND U.S.A.
1944 - 1955

(Rate Per 100,000 Population)

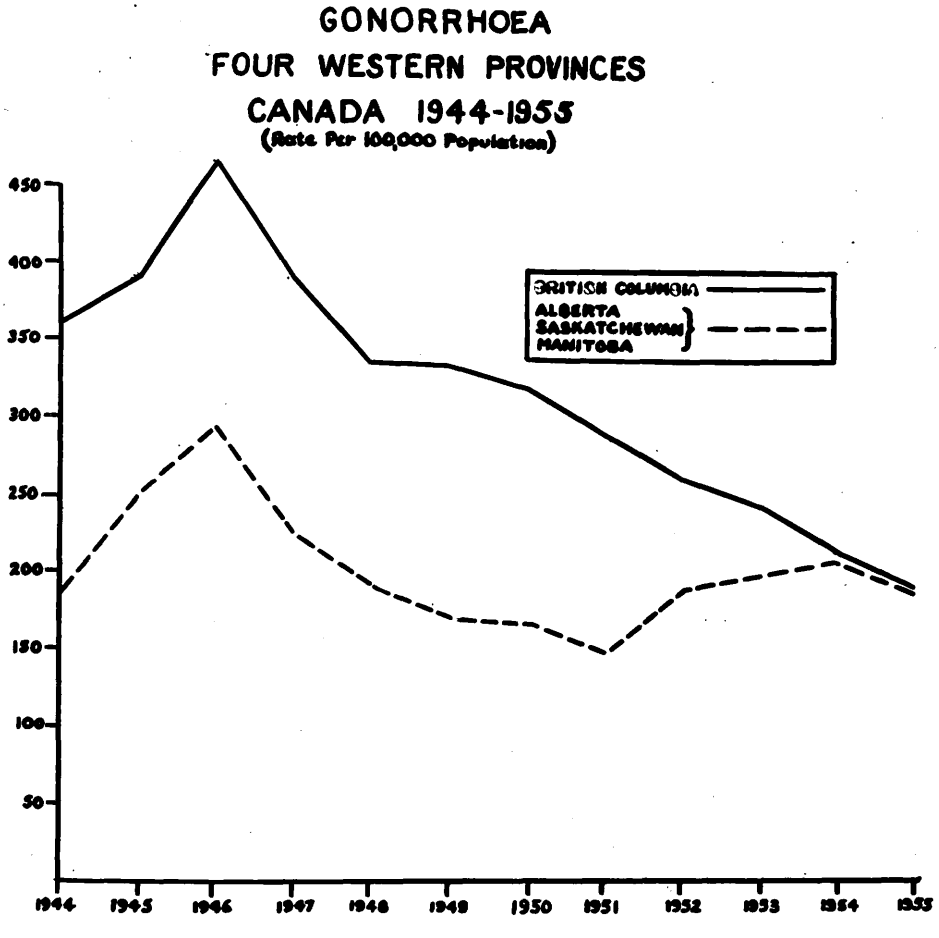


countries, following the peak incidence of 1946, there was a progressive decline in case rates until 1951 and that, since then, the rates have remained virtually static. These trends may be compared with those for gonorrhoea morbidity reporting in British Columbia and adjacent provinces over the same period (Figure 3). It will be noted that British Columbia participated with other provincial health jurisdictions in the general decline in the incidence of gonorrhoea which followed the post-war peak of 1946.

The factors contributing to this general decline in gonorrhoea incidence have not been fully elucidated although they may possibly be analogous to those described by Moore[3] in connection with the overall decline in the incidence of syphilis. At any rate, it now appears unlikely that the immediate post-war decline in gonorrhoea was attributable to the application of control measures per se. This conclusion is borne out by the subsequent course of events when the experience in most areas was that of a stationary or rising trend in the incidence of this disease.

In British Columbia, the post-war decline in gonorrhoea incidence ceased as early as 1948, and gonorrhoea rates were more or less stationary through

Figure 3.


GONORRHOEA
FOUR WESTERN PROVINCES
CANADA 1944-1955
(Rate Per 100,000 Population)
450
400
350
300
250
200
150
100
50
BRITISH COLUMBIA
ALBERTA
SASKATCHEWAN
MANITOBA
1944
1945
1946
1947
1948
1949
1950
1951
1952
1953
1954
1955

1949 and 1950 (Figure 3), whereas in Canada and the continental United States, the decline in gonorrhoea incidence continued until 1951. It was at this early stage that the inescapable conclusion was reached that if further advances were to be made in the control of this disease in British Columbia, then there would have to be a reorientation of the objectives and activities of the control organization, and a sincere attempt made to devise new approaches and answers to those apparently refractory problems which were hindering our efforts.

Since 1949, and at an accelerated pace since 1952, a series of studies upon problems related to the epidemiology of gonorrhoea have been carried on in British Columbia. These studies were designed to shed light upon the public health problem presented by gonorrhoea and upon the reasons for the relative failure of the control program against this disease. They had as their objectives the elucidation of basic epidemiologic information regarding this infection and the development of rational control measures based upon applied epidemiology. It is the purpose of the present contribution to report upon what has been achieved to date.

At the outset, it may perhaps be considered of interest to present a critical review of our past and

present thinking regarding the epidemiology of gonorrhoea as a preliminary to the study and evaluation of the control techniques subsequently developed. In the first place, it was clearly recognized that there existed three major case-finding measures in gonorrhoea -- education, screening of selected groups and contact-tracing. A comparison of the relative advantages and disadvantages of these three case-finding activities appeared to indicate that effective contact tracing offered the greatest possibilities for making a focal attack upon the problem of gonorrhoea. By this time, the optimistic hope which prevailed, earlier and elsewhere, that penicillin therapy was so highly specific for gonococcal infection that it was sufficient to treat only the known cases and that, with the onset of symptoms, contacts could be relied upon to seek medical care, had been disproved to our way of thinking. It was therefore decided in 1949 to develop and improve contact tracing as the epidemiologic weapon with which to make a strategic attack upon gonorrhoea.

Prior to that year, contact tracing had been developed to the utmost against syphilis, which was considered to be the more serious venereal disease. Contact tracing, although included in the gonorrhoea case-finding program, was haphazard and unorganized. Thus, the follow-up of

readily identifiable contacts of cases reported by venereal disease clinics was pushed. Rather less effort was made to ascertain and follow up the contacts of cases reported by private physicians. Little was done to identify the reservoir of infection responsible for perpetuation of the disease and the efficiency and achievement trends of contact tracing were not quantitatively assayed.

From 1949 onwards, an attempt was made to remedy some of the deficiencies which had previously existed in the gonorrhoea contact tracing program. Intensive interviewing for contacts was undertaken upon all patients seen at venereal disease clinics. Since it was apparent that many gonorrhoea patients were diagnosed in the first instance, by private physicians -- and that many of the morbidity reports from the latter contributed little to the program because of inadequate, or no contact information -- certain responsibilities were assigned to the provincial Health Units working in close contact with the local private physicians. All Health Units and other health agencies were instructed that every gonorrhoea morbidity report "prior to submission to the Division of Venereal Disease Control, should be scrutinized for contact information. Where the attending physician fails to list a minimum of one contact per notified case, the Health Unit

should take steps to see that he is made aware of the importance of his contribution to the overall control program. The modus operandi here should be for the Health Unit to make an offer of aid (in the elicitation and follow-up of contacts) so convincingly extended and so helpfully applied as to earn willing acceptance."

In order that contact tracing might be quantitated so as to determine its efficiency and to permit comparative evaluation of the contributions made to the program by private physicians and trained epidemiological workers from the venereal disease clinics, gonorrhoea contact indices (per 100 reported cases) were maintained. That these measures, undertaken as part of the intensive contact tracing program, were moderately successful, is revealed upon a critical re-evaluation later in this thesis of the epidemiologic data for the period 1949-1953.

Epidemiological studies undertaken in 1952 and 1953 were perhaps the most important contribution to our understanding of the epidemiology of gonorrhoea and were the determining factor in the introduction of selective contact tracing. These studies, which have been fully described in the literature[30] brought out that:

(a) one venereal disease patient in every three was so little influenced by his previous disease experience

that he became a repeater patient, often in short order,

(b) there was an important sex differential in gonorrhoea case reporting. Thus, in studying the ratio of female/male morbidity reports over the preceding nine years (1944-1952), it was found that this ratio varied between 0.32 and 0.49, the summary experience over the entire period being a ratio of 0.40 (Table 29). Since one can postulate, theoretically at least, a female/male ratio approximating unity, this data suggested that there must be a reservoir of infected and undiagnosed females responsible for perpetuation of the disease, and pointed to the necessity for increased case-finding efforts among females in an attempt to alter the abnormal sex ratio and presumably halt transmission of the disease,

(c) there existed a sizeable female reservoir of gonorrhoea as shown by the examination of highly promiscuous females at the Vancouver Gaol Examination Centre. Between 1947, when the centre was organised, and 1952, a considerable proportion ranging from 11.4 to 18.1 per cent of all females examined there, were found to have previously untreated gonorrhoea (Table 30).

Table 29.

NEW NOTIFICATIONS OF GONORRHOEA, BY SEX,
BRITISH COLUMBIA, 1944 - 1952

YEAR	TOTAL	FEMALE	MALE	FEMALE/MALE RATIO
1944	3,358	898	2,460	0.37
1945	3,711	1,029	2,682	0.38
1946	4,618	1,374	3,244	0.42
1947	4,056	1,131	2,925	0.39
1948	3,608	1,033	2,575	0.40
1949	3,694	1,181	2,513	0.47
1950	3,627	1,199	2,428	0.49
1951	3,336	875	2,461	0.36
1952	3,098	746	2,352	0.32
TOTAL	33,106	9,466	23,640	0.40

Table 30.

ACTIVITIES OF THE VANCOUVER FEMALE GOAL EXAMINATION CENTRE
1947 - 1955

FEMALES	1947 (8 mos. May - Dec)		1948		1949		1950	
	No.	%	No.	%	No.	%	No.	%
Examined	471	-	1091	-	963	-	903	-
Named as contacts	24	5.1	96	8.8	94	9.8	94	10.4
Found infected and not prev. diagnosed	106	22.5	155	14.2	135	14.0	149	16.5
Syphilis	39	8.3	31	2.8	5	0.5	6	0.7
Gonorrhoea	67	14.2	124	11.4	130	13.5	143	15.8

FEMALES	1951		1952		1953		1954		1955	
	No.	%	No.	%	No.	%	No.	%	No.	%
Examined	901	-	962	-	868	-	971	-	1132	-
Named as contacts	115	12.8	104	10.8	127	14.6	162	16.7	238	21.0
Found infected and not prev. diagnosed	168	18.6	122	12.7	76	8.7	140	14.4	179	15.8
Syphilis	5	0.5	-	-	2	0.2	3	0.3	-	-
Gonorrhoea	163	18.1	122	12.7	74	8.5	137	14.1	179	15.8

(d) a successful epidemiological attack upon gonorrhoea involved recognition of the fact that the reservoir of infection was female and largely unidentified, and that the objective of epidemiology must be to bring the infected female to treatment before she can disseminate her infection to a third party. In essence, this meant that the female with undiagnosed gonorrhoea had to be identified through her recent male contact and be brought to treatment within a matter of hours.

A planned focal attack upon the reservoir of gonorrhoea, based upon the above principles, was incorporated in a fourpoint 'speed-zone' project, instituted by the Division of Venereal Disease Control in August, 1953. The objectives of this project were defined as follows:-

(a) to interview all male gonorrhoea patients for information regarding their significant female contacts i.e., those during the six-day period prior to the onset of symptoms. This selective type of contact interviewing was based upon the belief that the male patient could be used as a signpost leading towards the detection of an infected female contact or even potential carrier who would, in all probability, not come to treatment

of her own accord. This concentration of effort upon female contacts of known male cases was based upon the further belief that infected male contacts of known female cases -- owing to the short incubation period of gonorrhoea and its obvious clinical manifestations in the male -- would probably come to treatment voluntarily,

(b) to locate identifiable female contacts within a matter of hours in order to minimize numerical opportunities for the dissemination of infection,

(c) to treat female contacts immediately upon epidemiological grounds as suspect carriers, although when practicable, urethral and cervical smears and cultures were to be taken before treatment to determine if a bacteriological diagnosis could be made. This procedure appeared justifiable on the grounds that it is a difficult matter at any time to make a bacteriological diagnosis of gonorrhoea in women and even more difficult to determine that a given female is free of infection,

(d) to control community conditions facilitating the acquisition and spread of venereal disease, which was considered to be just as important in an epidemiological program of this nature as it was formerly.

Method:

In attempting to evaluate the selective contact tracing elements of this program, it soon became evident that there was a real need to develop achievement indices to determine if objectives (a) and (b) above, were being met. As a result of further studies, certain evaluation techniques were devised for this purpose.

(a) Since interviewing of male patients for information regarding their significant female contacts is the crux of selective contact tracing, the contact, epidemiologic, and brought to treatment indices of Iskrant and Kahn[41] were used, on a semi-annual sex-specific basis, for evaluation of this new type of gonorrhoea contact tracing. More specifically, it was decided that the sex-specific brought to treatment index obtained from the follow-up of female contacts of male patients was to be regarded as the critical index of achievement in selective contact tracing. Further, in order to evaluate and compare the contributions made to the program by private physicians and by trained epidemiological workers from the venereal disease clinics, arrangements were made for the computation of each sex-specific index on the basis of reporting agency.

The data necessary for the calculation of all indices were taken from the following tabulations run from the punch cards 'notification of venereal infection' and 'contact investigation report' (Chart I) routinely prepared from each new venereal disease notification:

(1) A run of new notification of venereal infection cards showing new cases of gonorrhoea (code 2, column 7) by reporting agency (code 20 for private physicians and code 1-9 inclusive for divisional clinics on columns 28 and 29) by sex (column 8).

(2) A run of contact investigation cards showing contacts to gonorrhoea cases (code 01, columns 13 and 14) by agency reporting (code 20 for private physicians and code 1-9 inclusive for divisional clinics on columns 7 and 8) by result of examination (code 2 infected with gonorrhoea, column 37) by previously diagnosed (code 1 not previously diagnosed on column 54) by sex (column 20).

Since it was desired to have these indices computed on a quarterly and semi-annual basis, the format shown in Table 31 was used.

Calculation of Indices:

A. Contact Indices

The numerators for these indices are taken from

PUNCH CARDS 'NOTIFICATION OF VENEREAL INFECTION' AND 'CONTACT INVESTIGATION REPORT' AS USED IN DIVISION OF VENEREAL DISEASE CONTROL. PROVINCE OF BRITISH COLUMBIA.

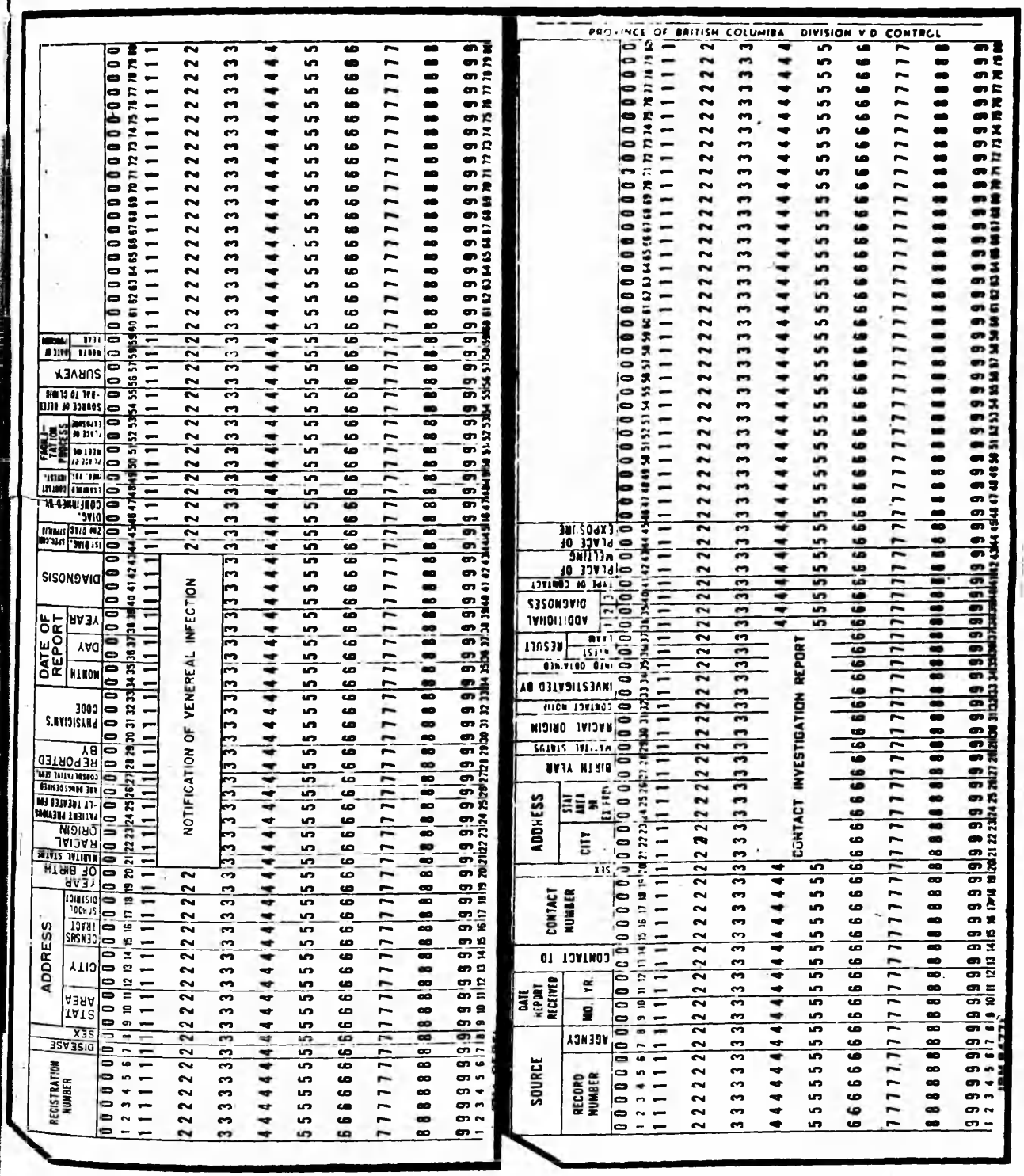


Table 31.

Quarterly Gonorrhoea Contact Indices by Reporting Agency and Sex, British Columbia, Period . . .

	V.D. Control Clinics			Private Physicians		
	New Cases	Contacts Elicited	Contact Indices	New Cases	Contacts Elicited	Contact Indices
Male						
Female						

Quarterly Gonorrhoea Epidemiologic Indices by Reporting Agency and Sex, British Columbia, Period . . .

	V.D. Control Clinics			Private Physicians		
	New Cases	Infected Contacts	Epide-miologic Indices	New Cases	Infected Contacts	Epide-miologic Indices
Male						
Female						

Quarterly Gonorrhoea Brought to Treatment Indices by Reporting Agency and Sex, British Columbia, Period . . .

	V.D. Control Clinics			Private Physicians		
	New Cases	Infected Contacts Not Prev. Diagnosed	Brought to Treatment Indices	New Cases	Infected Contacts Not Prev. Diagnosed	Brought to Treatment Indices
Male						
Female						

code 01, columns 13 and 14, (contacts to gonorrhoea cases) according to sex on the contact investigation cards. The denominators are taken from code 2 column 7 (new gonorrhoea cases) according to sex on the new notification of venereal infection cards.

1. Contact index: male

   a) Divisional clinics

$$\frac{\text{Number of female contacts reported by divisional clinics per quarter}}{\text{Number of new male cases reported by divisional clinics in the same quarter}} \times 100$$

   b) Private physicians

$$\frac{\text{Number of female contacts reported by private physicians per quarter}}{\text{Number of new male cases reported by private physicians in the same quarter}} \times 100$$

2. Contact index: female

   a) Divisional clinics

$$\frac{\text{Number of male contacts reported by divisional clinics per quarter}}{\text{Number of new female cases reported by divisional clinics in the same quarter}} \times 100$$

   b) Private physicians

$$\frac{\text{Number of male contacts reported by private physicians per quarter}}{\text{Number of new female cases reported by private physicians in the same quarter}} \times 100$$

B. Epidemiologic Indices

The numerators for these indices are taken from code 2, column 37 (infected with gonorrhoea) according

to sex for all contacts to gonorrhoea cases (code 01, columns 13 and 14) on contact investigation cards. The denominators are taken from new notification of venereal infection cards, as outlined under the section for contact indices.

1. Epidemiologic index: male

   a) Divisional clinics

$$\frac{\text{Total number of female contacts infected with gonorrhoea reported by divisional clinics per quarter}}{\text{Number of new male cases reported by divisional clinics in the same quarter}} \times 100$$

   b) Private physicians

$$\frac{\text{Total number of female contacts infected with gonorrhoea reported by private physicians per quarter}}{\text{Number of new male cases reported by private physicians in the same quarter}} \times 100$$

2. Epidemiologic index: female

   a) Divisional clinics

$$\frac{\text{Number of male contacts infected with gonorrhoea reported by divisional clinics per quarter}}{\text{Number of new female cases reported by divisional clinics in the same quarter}} \times 100$$

   b) Private physicians

$$\frac{\text{Number of male contacts infected with gonorrhoea reported by private physicians per quarter}}{\text{Number of new female cases reported by private physicians in the same quarter}} \times 100$$

C. Brought to Treatment Indices

The numerator for these indices is taken from the contacts to gonorrhoea (code 01, columns 13 and 14) who were infected with gonorrhoea (code 2, column 37) and had not been previously diagnosed (code 1, column 54) according to sex on the contact investigation cards. The denominators are the same as for contact and epidemiologic indices.

1. Brought to Treatment index: male

a) Divisional clinics

$$\frac{\text{Total number of female contacts, infected with gonorrhoea and not previously diagnosed, reported by divisional clinics per quarter}}{\text{Number of new male cases reported by divisional clinics in the same quarter}} \times 100$$

b) Private Physicians

$$\frac{\text{Total number of female contacts, infected with gonorrhoea and not previously diagnosed, reported by private physicians per quarter}}{\text{Number of new male cases reported by private physicians in the same quarter}} \times 100$$

2. Brought to Treatment index: female

a) Divisional clinics

$$\frac{\text{Total number of male contacts, infected with gonorrhoea and not previously diagnosed, reported by divisional clinics per quarter}}{\text{Number of new female cases reported by Divisional clinics in the same quarter}} \times 100$$

b) Private Physicians

$$\frac{\text{Total number of male contacts, infected with gonorrhoea and not previously diagnosed, reported by private physicians per quarter}}{\text{Number of new female cases reported by private physicians in the same quarter}} \times 100$$

By using these sex-specific gonorrhoea contact, epidemiologic, and brought to treatment indices, it was found possible to evaluate the achievements in gonorrhoea contact tracing, of clinic personnel and private physicians during both the intensive contact tracing period (January 1, 1949 to June 30, 1953) and the speed-zone period (July 1, 1953 to December 31, 1955). The raw data are given in Tables 32-43 inclusive, and are summarised in Chart II.

(b) It was equally obvious that the value of specialized contact investigation of this type would probably be in direct proportion to the length of time by which the infectious period was shortened in those contacts who were infected -- a consideration of the utmost importance in the case of female contacts who might be unaware that they had been infected. Indeed, the success or failure of the 'speed-zone' project must also be gauged by the rapidity with which infected females are brought to treatment and the infectious period thereby shortened.

In order to determine whether a significantly larger number of infected female contacts were brought to treatment earlier by the application of 'speed-zone' techniques as compared with conventional contact tracing, a special study was undertaken on clinic patients only. The numbers of new cases of gonorrhoea in females brought to treatment through contact investigation during the 13 months, July 1, 1952 - July 31, 1953, the latter part of the intensive contact tracing period, with the time lapse in days between identification as a contact and treatment, were compared with the numbers brought to treatment during the 17 months, August 1, 1953 - December 31, 1954, the early part of the speed-zone period. The relevant data are presented in Tables 44 and 45.

(c) The final study was designed to test the validity of the working hypothesis that since the reservoir of infection in gonorrhoea is largely female, then selective contact tracing aimed at bringing infected females in greater numbers to early treatment (if necessary on epidemiological grounds) will diminish transmission of the disease.

If this hypothesis is correct, and the control

measures are effective, then one would anticipate (1) a decrease in male morbidity with the expectation that as the female reservoir is decreased, morbidity for both sexes would decline, and (2) an alteration in the abnormal sex ratio in this disease with approximation to the theoretical unitary relationship suggested in an earlier section. In either case, the change should be evident in the study or speed-zone period (1953-1955) as compared with the control or intensive contact tracing period (1949-1952).

Tables 46 and 47 present the numbers of reported gonorrhoea cases and morbidity rates, by sex, for the period 1949-1955. Table 48 shows the female / male ratios for gonorrhoea notifications during the same period.

Results:

Table 32.

QUARTERLY AND SEMI-ANNUAL GONORRHOEA CONTACT INDICES - MALE BY REPORTING AGENCY, 1949-1955

PERIOD	CASES REPORTED BY V.D. CONTROL CLINICS					
	New Male Cases		Contacts Elicited		Contact Indices	
1949 1st Qtr	376	689	363	682	97	99
2nd Qtr	313		319		102	
3rd Qtr	343	702	333	715	97	102
4th Qtr	359		382		106	
YEAR	1391		1397		100	
1950 1st Qtr	286	661	412	684	144	103
2nd Qtr	375		272		73	
3rd Qtr	395	702	380	722	96	103
4th Qtr	307		342		111	
YEAR	1363		1406		103	
1951 1st Qtr	366	647	399	729	109	113
2nd Qtr	281		330		117	
3rd Qtr	338	589	375	656	111	111
4th Qtr	251		281		112	
YEAR	1236		1385		112	
1952 1st Qtr	272	530	313	628	115	118
2nd Qtr	258		315		122	
3rd Qtr	227	442	252	521	111	118
4th Qtr	215		269		125	
YEAR	972		1149		118	
1953 1st Qtr	230	389	266	474	116	122
2nd Qtr	159		208		131	
3rd Qtr	247	479	309	571	125	119
4th Qtr	232		262		113	
YEAR	868		1045		120	
1954 1st Qtr	246	423	268	499	109	118
2nd Qtr	177		231		131	
3rd Qtr	162	298	195	400	120	134
4th Qtr	136		205		151	
YEAR	721		899		125	
1955 1st Qtr	138	267	209	381	151	143
2nd Qtr	129		172		133	
3rd Qtr	125	282	177	418	142	148
4th Qtr	157		241		154	
YEAR	549		799		146	

Table 33.

QUARTERLY AND SEMI-ANNUAL GONORRHOEA CONTACT INDICES - MALE BY REPORTING AGENCY, 1949-1955

PERIOD	CASES REPORTED BY PRIVATE PHYSICIANS					
	New Male Cases		Contacts Elicited		Contact Indices	
1949 1st Qtr	239	482	201	405	84	84
2nd Qtr	243		204		84	
3rd Qtr	296	561	249	499	84	89
4th Qtr	265		250		94	
YEAR	1043		904		87	
1950 1st Qtr	202	411	181	362	90	88
2nd Qtr	209		181		87	
3rd Qtr	270	543	239	496	89	91
4th Qtr	273		257		94	
YEAR	954		858		90	
1951 1st Qtr	196	469	180	453	92	97
2nd Qtr	273		273		100	
3rd Qtr	305	587	278	547	91	93
4th Qtr	282		269		95	
YEAR	1056		1000		95	
1952 1st Qtr	245	557	229	510	93	92
2nd Qtr	312		281		90	
3rd Qtr	335	661	314	619	94	94
4th Qtr	326		305		94	
YEAR	1218		1129		93	
1953 1st Qtr	272	491	261	506	96	103
2nd Qtr	219		245		112	
3rd Qtr	425	693	395	656	93	95
4th Qtr	268		261		97	
YEAR	1184		1162		98	
1954 1st Qtr	249	485	254	482	102	99
2nd Qtr	236		228		97	
3rd Qtr	314	599	313	581	100	97
4th Qtr	285		268		94	
YEAR	1084		1063		98	
1955 1st Qtr	241	447	229	443	95	99
2nd Qtr	206		214		104	
3rd Qtr	259	533	272	539	105	101
4th Qtr	274		267		97	
YEAR	980		982		100	

Table 34.

QUARTERLY AND SEMI-ANNUAL GONORRHOEA EPIDEMIOLOGIC INDICES - MALE BY REPORTING AGENCY, 1949-1955

PERIOD		CASES REPORTED BY V.D. CONTROL CLINICS					
		New Male Cases		Infected Contacts		Epidemiologic Indices	
1949	1st Qtr	376	689	130	257	35	37
	2nd Qtr	313		127		41	
	3rd Qtr	343	702	121	263	35	37
	4th Qtr	359		142		40	
	YEAR	1391		520		37	
1950	1st Qtr	286	661	186	279	65	42
	2nd Qtr	375		93		25	
	3rd Qtr	395	702	143	265	36	38
	4th Qtr	307		122		40	
	YEAR	1363		544		40	
1951	1st Qtr	366	647	162	277	44	43
	2nd Qtr	281		115		41	
	3rd Qtr	338	589	132	238	39	40
	4th Qtr	251		106		42	
	YEAR	1236		515		42	
1952	1st Qtr	272	530	118	228	43	43
	2nd Qtr	258		110		43	
	3rd Qtr	227	442	84	169	37	38
	4th Qtr	215		85		40	
	YEAR	972		397		41	
1953	1st Qtr	230	389	94	170	41	44
	2nd Qtr	159		76		48	
	3rd Qtr	247	479	130	270	53	56
	4th Qtr	232		140		60	
	YEAR	868		440		51	
1954	1st Qtr	246	423	123	233	50	55
	2nd Qtr	177		110		62	
	3rd Qtr	162	298	78	180	48	60
	4th Qtr	136		102		75	
	YEAR	721		413		57	
1955	1st Qtr	138	267	96	184	71	69
	2nd Qtr	129		88		68	
	3rd Qtr	125	282	69	185	55	66
	4th Qtr	157		116		74	
	YEAR	549		369		67	

Table 35.

QUARTERLY AND SEMI-ANNUAL GONORRHOEA EPIDEMIOLOGIC INDICES - MALE BY REPORTING AGENCY, 1949-1955

PERIOD	CASES REPORTED BY PRIVATE PHYSICIANS					
	New Male Cases		Infected Contacts		Epidemiologic Indices	
1949 1st Qtr	239	482	33	92	14	19
2nd Qtr	243		59		24	
3rd Qtr	296	561	57	133	19	24
4th Qtr	265		76		29	
YEAR	1043		225		22	
1950 1st Qtr	202	411	51	97	25	24
2nd Qtr	209		46		22	
3rd Qtr	270	543	43	109	16	20
4th Qtr	273		66		24	
YEAR	954		206		22	
1951 1st Qtr	196	469	63	145	32	31
2nd Qtr	273		82		30	
3rd Qtr	305	587	67	133	22	23
4th Qtr	282		66		23	
YEAR	1056		278		26	
1952 1st Qtr	245	557	55	133	22	24
2nd Qtr	312		78		25	
3rd Qtr	335	661	89	173	27	26
4th Qtr	326		84		26	
YEAR	1218		306		25	
1953 1st Qtr	272	491	82	163	30	33
2nd Qtr	219		81		37	
3rd Qtr	425	693	155	255	36	37
4th Qtr	268		100		37	
YEAR	1184		418		35	
1954 1st Qtr	249	485	109	184	44	38
2nd Qtr	236		75		32	
3rd Qtr	314	599	113	217	36	36
4th Qtr	285		104		36	
YEAR	1084		401		37	
1955 1st Qtr	241	447	88	143	37	32
2nd Qtr	206		55		28	
3rd Qtr	259	533	68	163	26	31
4th Qtr	274		95		35	
YEAR	980		306		31	

Table 36.

QUARTERLY AND SEMI-ANNUAL GONORRHOEA BROUGHT TO TREATMENT INDICES - MALE BY REPORTING AGENCY, 1949 - 1955

PERIOD		CASES REPORTED BY V.D. CONTROL CLINICS					
		New Male Cases		Infected Contacts Not Prev. Diagnosed		Brought to Treatment Indices	
1949	1st Qtr	376	689	48	114	13	17
	2nd Qtr	313		66		21	
	3rd Qtr	343	702	82	180	24	26
	4th Qtr	359		98		27	
	YEAR	1391		294		21	
1950	1st Qtr	286	661	128	193	45	29
	2nd Qtr	375		65		17	
	3rd Qtr	395	702	111	196	28	28
	4th Qtr	307		85		28	
	YEAR	1363		389		29	
1951	1st Qtr	366	647	121	198	33	31
	2nd Qtr	281		77		27	
	3rd Qtr	338	589	101	186	30	32
	4th Qtr	251		85		34	
	YEAR	1236		384		31	
1952	1st Qtr	272	530	90	176	33	33
	2nd Qtr	258		86		33	
	3rd Qtr	227	442	64	121	28	27
	4th Qtr	215		57		27	
	YEAR	972		297		31	
1953	1st Qtr	230	389	59	117	26	30
	2nd Qtr	159		58		36	
	3rd Qtr	247	479	96	197	39	41
	4th Qtr	232		101		44	
	YEAR	868		314		36	
1954	1st Qtr	246	423	90	173	37	41
	2nd Qtr	177		83		47	
	3rd Qtr	162	298	51	122	31	41
	4th Qtr	136		71		52	
	YEAR	721		295		41	
1955	1st Qtr	138	267	68	128	49	48
	2nd Qtr	129		60		47	
	3rd Qtr	125	282	48	139	38	49
	4th Qtr	157		91		58	
	YEAR	549		267		49	

Table 37.

QUARTERLY AND SEMI-ANNUAL GONORRHOEA BROUGHT TO TREATMENT INDICES - MALE BY REPORTING AGENCY
1949 - 1955

PERIOD	CASES REPORTED BY PRIVATE PHYSICIANS					
	New Male Cases		Infected Contacts Not Prev. Diagnosed		Brought to Treatment Indices	
1949 1st Qtr	239	482	18	64	8	13
2nd Qtr	243		46		19	
3rd Qtr	296	561	30	65	10	12
4th Qtr	265		35		13	
YEAR	1043		129		12	
1950 1st Qtr	202	411	34	56	17	14
2nd Qtr	209		22		11	
3rd Qtr	270	543	28	71	10	13
4th Qtr	273		43		16	
YEAR	954		127		13	
1951 1st Qtr	196	469	34	77	17	16
2nd Qtr	273		43		16	
3rd Qtr	305	587	50	98	16	17
4th Qtr	282		48		17	
YEAR	1056		175		17	
1952 1st Qtr	245	557	36	78	15	14
2nd Qtr	312		42		13	
3rd Qtr	335	661	61	119	18	18
4th Qtr	326		58		18	
YEAR	1218		197		16	
1953 1st Qtr	272	491	56	109	21	22
2nd Qtr	219		53		24	
3rd Qtr	425	693	89	151	21	22
4th Qtr	268		62		23	
YEAR	1184		260		22	
1954 1st Qtr	249	485	65	117	26	24
2nd Qtr	236		52		22	
3rd Qtr	314	599	74	138	24	23
4th Qtr	285		64		22	
YEAR	1084		255		24	
1955 1st Qtr	241	447	62	93	26	21
2nd Qtr	206		31		15	
3rd Qtr	259	533	54	121	21	23
4th Qtr	274		67		24	
YEAR	980		214		22	

Table 38.

QUARTERLY AND SEMI-ANNUAL GONORRHOEA CONTACT INDICES - FEMALE BY REPORTING AGENCY, 1949-1955

PERIOD		CASES REPORTED BY V.D. CONTROL CLINICS					
		New Female Cases		Contacts Elicited		Contact Indices	
1949	1st Qtr	212	426	206	409	97	96
	2nd Qtr	214		203		95	
	3rd Qtr	198	420	189	413	95	98
	4th Qtr	222		224		101	
	YEAR	846		822		97	
1950	1st Qtr	275	447	258	428	94	96
	2nd Qtr	172		170		99	
	3rd Qtr	246	405	205	370	83	91
	4th Qtr	159		165		104	
	YEAR	852		798		94	
1951	1st Qtr	174	325	216	383	124	118
	2nd Qtr	151		167		111	
	3rd Qtr	132	269	169	326	128	121
	4th Qtr	137		157		115	
	YEAR	594		709		119	
1952	1st Qtr	137	278	151	317	110	114
	2nd Qtr	141		166		118	
	3rd Qtr	96	181	138	254	144	140
	4th Qtr	85		116		136	
	YEAR	459		571		124	
1953	1st Qtr	84	147	128	246	152	167
	2nd Qtr	63		118		187	
	3rd Qtr	124	222	197	278	159	125
	4th Qtr	98		81		83	
	YEAR	369		524		142	
1954	1st Qtr	83	178	180	348	217	196
	2nd Qtr	95		168		177	
	3rd Qtr	66	126	155	258	235	205
	4th Qtr	60		103		172	
	YEAR	304		606		199	
1955	1st Qtr	85	175	117	193	138	110
	2nd Qtr	90		76		84	
	3rd Qtr	73	161	63	163	86	101
	4th Qtr	88		100		114	
	YEAR	336		356		106	

Table 39.

QUARTERLY AND SEMI-ANNUAL GONORRHOEA CONTACT INDICES - FEMALE BY REPORTING AGENCY, 1949 - 1955

PERIOD	CASES REPORTED BY PRIVATE PHYSICIANS		
	New Female Cases	Contacts Elicited	Contact Indices
1949 1st Qtr	77	56	73
2nd Qtr	64 141	42 98	66 70
3rd Qtr	97	81	84
4th Qtr	72 169	66 147	92 87
YEAR	310	245	79
1950 1st Qtr	63	60	95
2nd Qtr	74 137	38 98	51 72
3rd Qtr	68	83	122
4th Qtr	72 140	61 144	85 103
YEAR	277	242	87
1951 1st Qtr	59 141	50 126	85 89
2nd Qtr	82	76	93
3rd Qtr	47	62	132
4th Qtr	68 115	67 129	99 112
YEAR	256	255	100
1952 1st Qtr	66 104	49 105	74 101
2nd Qtr	38	56	147
3rd Qtr	59	69	117
4th Qtr	47 106	66 135	140 127
YEAR	210	240	114
1953 1st Qtr	80 127	64 146	80 115
2nd Qtr	47	82	174
3rd Qtr	75	116	155
4th Qtr	59 134	43 159	73 119
YEAR	261	305	117
1954 1st Qtr	47 82	59 119	126 145
2nd Qtr	35	60	171
3rd Qtr	42	74	176
4th Qtr	51 93	77 151	151 162
YEAR	175	270	154
1955 1st Qtr	36 70	77 147	214 210
2nd Qtr	34	70	206
3rd Qtr	38	55	145
4th Qtr	40 78	62 117	155 150
YEAR	148	264	178

Table 40.

QUARTERLY AND SEMI-ANNUAL GONORRHOEA EPIDEMIOLOGIC INDICES - FEMALE BY REPORTING AGENCY, 1949-1955

PERIOD		CASES REPORTED BY V.D. CONTROL CLINICS					
		New Female Cases		Infected Contacts		Epidemiologic Indices	
1949	1st Qtr	212	426	62	150	29	35
	2nd Qtr	214		88		41	
	3rd Qtr	198	420	72	172	36	41
	4th Qtr	222		100		45	
	YEAR	846		322		38	
1950	1st Qtr	275	447	110	182	40	41
	2nd Qtr	172		72		42	
	3rd Qtr	246	405	94	162	38	40
	4th Qtr	159		68		43	
	YEAR	852		344		40	
1951	1st Qtr	174	325	86	159	49	49
	2nd Qtr	151		73		48	
	3rd Qtr	132	269	77	131	58	49
	4th Qtr	137		54		39	
	YEAR	594		290		49	
1952	1st Qtr	137	278	65	123	47	44
	2nd Qtr	141		58		41	
	3rd Qtr	96	181	47	112	49	62
	4th Qtr	85		65		76	
	YEAR	459		235		51	
1953	1st Qtr	84	147	57	110	68	75
	2nd Qtr	63		53		84	
	3rd Qtr	124	222	62	140	50	63
	4th Qtr	98		78		80	
	YEAR	369		250		68	
1954	1st Qtr	83	178	71	123	86	69
	2nd Qtr	95		52		55	
	3rd Qtr	66	126	45	80	68	63
	4th Qtr	60		35		58	
	YEAR	304		203		67	
1955	1st Qtr	85	175	32	52	38	30
	2nd Qtr	90		20		22	
	3rd Qtr	73	161	25	56	34	35
	4th Qtr	88		31		35	
	YEAR	336		108		32	

Table 41.

QUARTERLY AND SEMI-ANNUAL GONORRHOEA EPIDEMIOLOGIC INDICES - FEMALE BY REPORTING AGENCY, 1949-1955

PERIOD		CASES REPORTED BY PRIVATE PHYSICIANS					
		New Female Cases		Infected Contacts		Epidemiologic Indices	
1949	1st Qtr	77	141	19	36	25	26
	2nd Qtr	64		17		27	
	3rd Qtr	97	169	31	59	32	35
	4th Qtr	72		28		39	
	YEAR	310		95		31	
1950	1st Qtr	63	137	27	42	43	31
	2nd Qtr	74		15		20	
	3rd Qtr	68	140	43	69	63	49
	4th Qtr	72		26		36	
	YEAR	277		111		40	
1951	1st Qtr	59	141	30	68	51	48
	2nd Qtr	82		38		46	
	3rd Qtr	47	115	36	62	77	54
	4th Qtr	68		26		38	
	YEAR	256		130		51	
1952	1st Qtr	66	104	23	51	35	49
	2nd Qtr	38		28		74	
	3rd Qtr	59	106	39	78	66	74
	4th Qtr	47		39		83	
	YEAR	210		129		61	
1953	1st Qtr	80	127	42	96	53	76
	2nd Qtr	47		54		115	
	3rd Qtr	75	134	78	126	104	94
	4th Qtr	59		48		81	
	YEAR	261		222		85	
1954	1st Qtr	47	82	42	76	89	93
	2nd Qtr	35		34		97	
	3rd Qtr	42	93	42	93	100	100
	4th Qtr	51		51		100	
	YEAR	175		169		97	
1955	1st Qtr	36	70	49	93	136	133
	2nd Qtr	34		44		129	
	3rd Qtr	38	78	27	65	71	83
	4th Qtr	40		38		95	
	YEAR	148		158		107	

Table 42.

QUARTERLY AND SEMI-ANNUAL GONORRHOEA BROUGHT TO TREATMENT INDICES - FEMALE BY REPORTING AGENCY
1949 - 1955

PERIOD		CASES REPORTED BY V.D. CONTROL CLINICS					
		New Female Cases		Infected Contacts Not Prev. Diagnosed		Brought to Treatment Indices	
1949	1st Qtr	212	426	9	23	4	5
	2nd Qtr	214		14		7	
	3rd Qtr	198	420	9	24	5	6
	4th Qtr	222		15		7	
	YEAR	846		47		6	
1950	1st Qtr	275	447	23	33	8	7
	2nd Qtr	172		10		6	
	3rd Qtr	246	405	21	28	9	7
	4th Qtr	159		7		4	
	YEAR	852		61		7	
1951	1st Qtr	174	325	13	20	7	6
	2nd Qtr	151		7		5	
	3rd Qtr	132	269	11	20	8	7
	4th Qtr	137		9		7	
	YEAR	594		40		7	
1952	1st Qtr	137	278	7	16	5	6
	2nd Qtr	141		9		6	
	3rd Qtr	96	181	4	9	4	5
	4th Qtr	85		5		6	
	YEAR	459		25		5	
1953	1st Qtr	84	147	2	6	2	4
	2nd Qtr	63		4		6	
	3rd Qtr	124	222	2	5	2	2
	4th Qtr	98		3		3	
	YEAR	369		11		3	
1954	1st Qtr	83	178	6	8	7	4
	2nd Qtr	95		2		2	
	3rd Qtr	66	126	-	1	-	1
	4th Qtr	60		1		2	
	YEAR	304		9		3	
1955	1st Qtr	85	175	1	2	1	1
	2nd Qtr	90		1		1	
	3rd Qtr	73	161	1	3	1	2
	4th Qtr	88		2		2	
	YEAR	336		5		1	

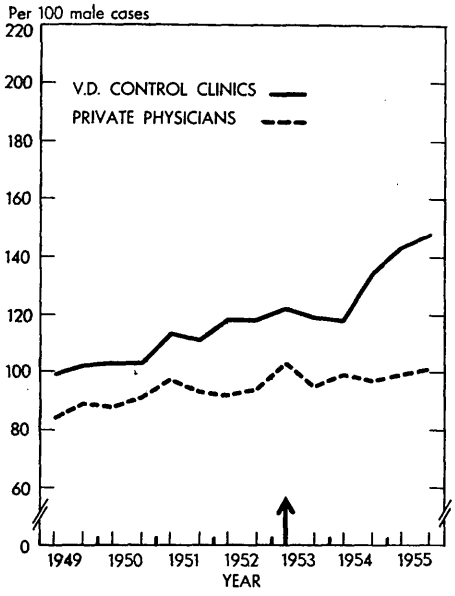
Table 43.

QUARTERLY AND SEMI-ANNUAL GONORRHOEA BROUGHT TO TREATMENT INDICES - FEMALE BY REPORTING AGENCY, 1949 - 1955

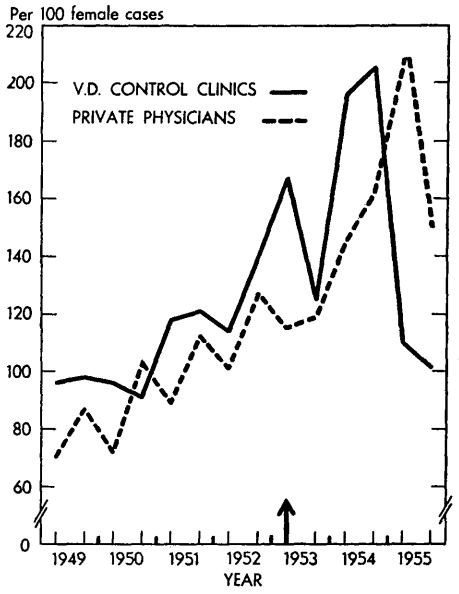
PERIOD	CASES REPORTED BY PRIVATE PHYSICIANS					
	New Female Cases		Infected Contacts Not Prev. Diagnosed		Brought to Treatment Indices	
1949 1st Qtr	77	141	5	5	6	4
2nd Qtr	64		-		-	
3rd Qtr	97	169	5	7	5	4
4th Qtr	72		2		3	
YEAR	310		12		4	
1950 1st Qtr	63	137	3	4	5	3
2nd Qtr	74		1		1	
3rd Qtr	68	140	15	16	22	11
4th Qtr	72		1		1	
YEAR	277		20		7	
1951 1st Qtr	59	141	4	9	7	6
2nd Qtr	82		5		6	
3rd Qtr	47	115	7	8	15	7
4th Qtr	68		1		1	
YEAR	256		17		7	
1952 1st Qtr	66	104	4	5	6	5
2nd Qtr	38		1		3	
3rd Qtr	59	106	3	7	5	7
4th Qtr	47		4		9	
YEAR	210		12		6	
1953 1st Qtr	80	127	5	13	6	10
2nd Qtr	47		8		17	
3rd Qtr	75	134	8	10	11	7
4th Qtr	59		2		3	
YEAR	261		23		9	
1954 1st Qtr	47	82	3	6	6	7
2nd Qtr	35		3		9	
3rd Qtr	42	93	5	5	12	5
4th Qtr	51		-		-	
YEAR	175		11		6	
1955 1st Qtr	36	70	3	6	8	9
2nd Qtr	34		3		9	
3rd Qtr	38	78	1	3	3	4
4th Qtr	40		2		5	
YEAR	148		9		6	

CHART II.—SEMI-ANNUAL GONORRHŒA INDICES BY SEX AND REPORTING AGENCY, BRITISH COLUMBIA, 1949–55

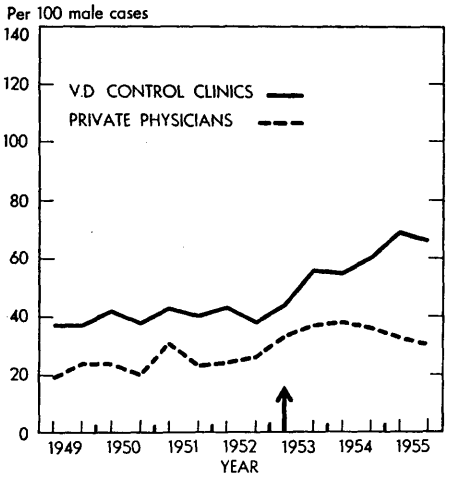
SEMI-ANNUAL GONORRHOEA CONTACT INDEX - MALE
By REPORTING AGENCY, BRITISH COLUMBIA, 1949-55



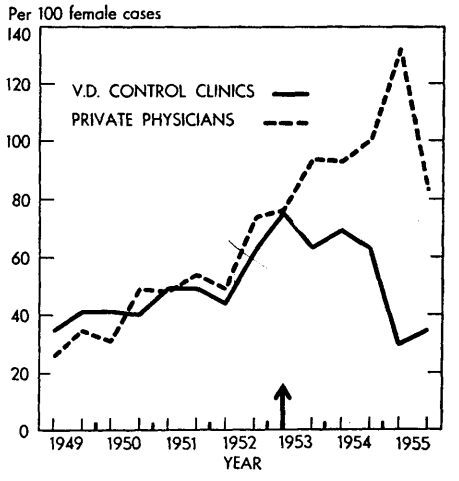
SEMI-ANNUAL GONORRHOEA CONTACT INDEX - FEMALE
By REPORTING AGENCY, BRITISH COLUMBIA, 1949-55



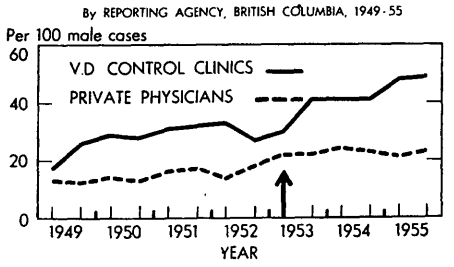
SEMI-ANNUAL GONORRHOEA EPIDEMIOLOGIC INDEX - MALE
By REPORTING AGENCY, BRITISH COLUMBIA, 1949-55



SEMI-ANNUAL GONORRHOEA EPIDEMIOLOGIC INDEX - FEMALE
By REPORTING AGENCY, BRITISH COLUMBIA, 1949-55



SEMI-ANNUAL GONORRHOEA BROUGHT TO TREATMENT INDEX MALE
By REPORTING AGENCY, BRITISH COLUMBIA, 1949-55



SEMI-ANNUAL GONORRHOEA BROUGHT TO TREATMENT INDEX - FEMALE
By REPORTING AGENCY, BRITISH COLUMBIA, 1949-55

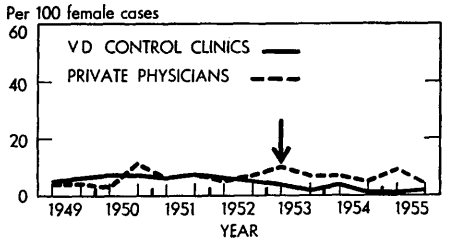


Table 44.

CUMULATIVE PERCENTAGE DISTRIBUTION OF NEW CASES OF GONORRHOEA AMONG FEMALES BROUGHT TO TREATMENT THROUGH CONTACT INVESTIGATION, ACCORDING TO TIME TAKEN TO BRING UNDER TREATMENT, BY CLINICS OF THE DIVISION OF VENEREAL DISEASE CONTROL, BRITISH COLUMBIA, JULY 1, 1952 - DECEMBER 31, 1954.

TIME BETWEEN BEING NAMED AS CONTACT AND TREATMENT (days)	CONTROL PERIOD		SPEED-ZONE PERIOD	
	No. of Cases	Cumulative Percentage	No. of Cases	Cumulative Percentage
Less than: 1	10	3.73	38	8.30
2	27	10.07	86	18.78
4	52	19.40	140	30.57
8	95	35.45	225	49.13
15	145	54.11	311	67.91
31	207	77.24	385	84.07
91	249	92.91	448	93.82
365	268	100	458	100

Table 45.

NUMBER OF NEW CASES OF GONORRHOEA AMONG FEMALES BROUGHT TO TREATMENT THROUGH CONTACT INVESTIGATION, ACCORDING TO TIME TAKEN TO BRING UNDER TREATMENT, BY CLINICS OF THE DIVISION OF VENEREAL DISEASE CONTROL, BRITISH COLUMBIA, JULY 1, 1952 - DECEMBER 31, 1954.

TIME BETWEEN BEING NAMED AS CONTACT AND TREATMENT (days)	NUMBER OF CASES BROUGHT TO TREATMENT		
	CONTROL PERIOD	SPEED-ZONE PERIOD	TOTAL
< 1	10	38	48
1	17	48	65
2-3	25	54	79
> 4	216	318	534
TOTAL	268	458	726

Table 46.

NEW NOTIFICATIONS OF GONORRHOEA AND RATES PER 100,000 POPULATION, FOR MALES, BRITISH COLUMBIA, 1949 - 1955.

YEAR	POPULATION	CASES	RATES
1949	575,300	2,513	436.8
1950	584,300	2,428	415.5
1951	597,000	2,461	412.2
1952	613,400	2,352	383.4
1953	628,400	2,239	356.3
1954	645,700	2,096	324.6
1955	664,300	1,878	282.7

Table 47.

NEW NOTIFICATIONS OF GONORRHOEA AND RATES PER 100,000 POPULATION, FOR FEMALES, BRITISH COLUMBIA, 1949 - 1955.

YEAR	POPULATION	CASES	RATES
1949	537,700	1,181	219.6
1950	552,700	1,199	216.9
1951	568,200	875	154.0
1952	584,600	746	127.6
1953	601,600	1,227*	204.0
1954	620,300	1,432*	230.9
1955	640,700	1,581*	246.8

* includes female contacts treated upon epidemiological grounds.

Table 48.

NEW NOTIFICATIONS OF GONORRHOEA, BY SEX, BRITISH COLUMBIA, 1949 - 1955.

YEAR	FEMALE	MALE	FEMALE/MALE RATIO
1949	1,181	2,513	0.47
1950	1,199	2,428	0.49
1951	875	2,461	0.36
1952	746	2,352	0.32
1953	1,227	2,239	0.55
1954	1,432	2,096	0.68
1955	1,581	1,878	0.84

Discussion:

Following the development of the sex-specific gonorrhoea contact, epidemiologic, and brought to treatment indices described earlier it became possible to evaluate the achievements of gonorrhoea contact tracing during both the intensive contact tracing period (January 1, 1949 to June 30, 1953) and the speed-zone period (July 1, 1953 to December 31, 1955) as well as to compare the contributions made to the program by private physicians and by trained epidemiological workers from the venereal disease clinics (Chart II). In the material which follows all achievement indices are based upon 100 reported cases of gonorrhoea, in either sex. For example, the contact index for males measures the number of female contacts obtained by interviewing 100 male gonorrhoea patients. The arrow on Chart II indicates the introduction of selective contact tracing under the speed-zone project.

Although, as previously pointed out, field investigation of male contacts to female gonorrhoea patients was not considered to be a worthwhile procedure because of the belief that infected male contacts would probably come to treatment of their own accord, nevertheless, it was felt that useful information could be obtained from the matching of records. Thus in reviewing the appropriate semi-annual

achievement indices (right-hand column in Chart II) it will be noted that most infected male contacts do, in fact, come to treatment voluntarily, as shown by the relatively high epidemiologic indices and that, as measured by the brought to treatment indices, contact tracing per se is not, and never has been a productive method of finding previously unknown male cases of gonorrhoea.

The progressive and marked increase in the female contact index obtained by private physicians during both the intensive contact tracing and the speed-zone periods would appear worthy of comment. Although not increasing the discovery of new cases of gonorrhoea in males, the private physicians obviously have the capacity to obtain information from females regarding their male contacts. This would appear to justify the assumption that they could effect a like improvement in their questioning of male cases regarding the all-important female contacts.

The critical indices are, of course, those which measure the results of contact investigation in female contacts of male patients. If our previous reasoning was correct then these indices are truly critical insofar as they should reflect both effort and achievement in attempts to reduce the reservoir of infection among

females. From perusal of the data given in the left-hand column of Chart II, it will be noted that the clinic epidemiological workers produced a progressive increase in their contact index for males, from 99 to 148, over the entire period under review. By contrast, the private physicians although able to effect an early improvement in their contact index from 84 to 103 during the intensive period, were unable to effect any further improvement and have not been able, even as yet, to maintain this critical index above 100 (one female contact per reported male patient).

Similar trends are apparent when the corresponding epidemiologic indices are considered. Thus, the clinic workers increased their epidemiologic index for males from 37 to 44 (19 percent) during the intensive contact tracing period and then further improved this index to a high of 69 (57 percent) with the advent of selective contact tracing. By way of comparison with the foregoing, the trend of the epidemiologic index for the private physicians patterned itself upon that of their contact index, with an early and marked increase in the epidemiologic index, from 19 to 33 (74 percent) during the intensive contact tracing period being followed by a more

or less stationary trend.

In terms of ultimate achievement, as measured by the male brought to treatment indices, it will be noted that the clinic epidemiologists improved their performance by almost doubling during the intensive contact tracing period, and subsequently trebling in the speed-zone period, the yield of new cases of gonorrhoea discovered in females as compared with that obtained for the first half of 1949. Again, the pattern of the brought to treatment index for the private physicians approximates to that described for their contact and epidemiologic indices with an increased yield of new cases among females during the intensive contact tracing period followed by a period during which no further improvement was made.

By means of these sex-specific contact, epidemiologic, and brought to treatment indices, it has therefore been found possible in evaluating our data, over the period 1949 to 1955, to analyze in some detail, and to demonstrate improvement in the accomplishments of contact investigation in gonorrhoea control. It would appear, however, that there is considerable room for improvement in the contribution which might be made by both clinic epidemiologists and private physicians in particular, towards the overall program.

On the basis of the evidence here presented, one can only conclude that unless and until the private physicians (a) are thoroughly indoctrinated with the potential importance of their contribution to contact tracing, (b) are made aware of the importance of the undiagnosed reservoir of gonorrhoea in females, and (c) acquire new attitudes and skills in interviewing male gonorrhoea patients for female contacts, then contact investigation in gonorrhoea is not being exploited to the utmost.

The increasing and major importance of the private physicians' role in gonorrhoea control is clearly evident from the fact that whereas in British Columbia in 1949, private physicians submitted 36.6 per cent, clinics 60.6 per cent, and other agencies 2.8 per cent of all morbidity reports, by 1955 these figures were 45.2 per cent, 35.5 per cent, and 19.3 per cent, respectively.

Attention was drawn earlier, in the description of the speed-zone project, to the importance of locating all female contacts within a matter of hours of identification in order to minimize numerical opportunities for dissemination of infection. In this connection, it is considered useful to know not only the contact index but also the time which elapsed between identification of the

female contact and her examination and treatment.

From the special study undertaken on clinic patients only (Tables 44 and 45), it will be observed that during the speed-zone period, approximately 19 per cent of all females brought to treatment through contact investigation were treated within 48 hours after they were named as contacts; 30 per cent were treated within 4 days; and 84 per cent within one month. By way of comparison, the corresponding figures for the control period were 10 per cent, 19 per cent, and 77 per cent, respectively. From statistical treatment of the data contained in Table 45, it can be stated that the introduction of speed-zone epidemiologic techniques into the clinics of the Division of Venereal Disease Control in British Columbia was effective in significantly reducing ($P < 0.01$) the time between being named as a contact and treatment of female gonorrhoea patients brought to treatment through contact investigation. This, in the final analysis, decreased the chances of the promiscuous male population acquiring a gonorrhoeal infection.

Finally, the point was made earlier that the effectiveness of selective contact tracing as part of the speed-zone project could be evaluated through a review of changes in male morbidity prior to, and during, the study period.

From Table 46, it will be noted that the male morbidity rate per 100,000 population decreased from 436.8 in 1949 to 356.3 in 1953 - an average yearly rate reduction of 4.6 per cent during the control or intensive contact tracing period. Following the institution of the speed-zone project in 1953, the male morbidity rate per 100,000 population declined sharply from 356.3 in 1953 to 282.7 in 1955 - an average yearly rate reduction of 10.3 per cent for the study period.

In the case of the females (Table 47), the morbidity rate per 100,000 which had fallen from 219.6 in 1949 to 127.6 in 1952, showed a precipitous rise with the onset of the speed-zone project in 1953. It would appear therefore that the results confirmed the hypothesis that as increasing numbers of infected females were brought to treatment, male morbidity would decline.

Coincident with the above, one would anticipate an alteration in the abnormal sex ratio in this disease (Table 48). The ratios of female to male patients were 0.47, 0.49, 0.36 and 0.32 for the four years preceding the study period. During the study period, 1953-1955, the corresponding ratios were 0.55, 0.68 and 0.84. It is interesting to note that this latter ratio is not far from the theoretical unitary relationship suggested earlier.

Summary:

(1) This presentation comprises studies in the applied epidemiology of gonorrhoea carried out in the Province of British Columbia.

(2) The material upon which the presentation is based consists of cases of gonorrhoea reported in British Columbia during 1949-1955.

(3) The method depends upon the evaluation of the effectiveness of gonorrhoea contact tracing as part of a conventional case-finding program, and as part of a four-point speed-zone project by means of (a) sex-specific statistical indices computed for both venereal disease clinic personnel and private physicians, (b) time studies to measure shortening of the infectious period of the disease in infected female contacts, and (c) changes in the picture of male morbidity.

(4) The applicability of the method to program control and evaluation is emphasized.

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